The Sport Fisheries of Mica, Opinicon, Sydenham, and Upper Rideau Lakes, 1984.

Rideau Lakes
Fisheries Assessment Unit
Report No. 11

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Depletion (of fish stocks) is not, as frequently understood a condition either of recent origin or of temporary nature. ... It would be better to consider depletion as a process and to understand how reduction of native stocks begins in the first place in order to appreciate the nature of the final stage... .

.....

This process has been going on (since early travellers and pioneer settlers first arrived)... . It has been assisted by almost every influence that has come about in the course of social and industrial progress. We have only to run through the list - deforestation, navigation facilities, water supply, pollution, power development, tourist trade and what not - to see how the process of fish extermination works.

.....

Viewing the matter historically, we have (in the southwestern portion of the province) ... a relatively small area which ... sustained ... the first shock of industrial development and depletion.

.....

While this development was going on, and during its advanced stages in the last century, the waters immediately along and to the northward of the pre-Cambrian line began to be accessible and also desirable from the summer visitor's point of view.

The waters involved were the Muskoka Lakes, to some extent the Georgian Bay and the magnificent lakes and streams of the Trent and Rideau systems, ... together with the upper reaches of the St. Lawrence River ... . It is the same waters, generally speaking, that are now in critical condition.

.....

Depletion is a process of long duration which can and in all Ontario situations is likely to be greatly accelerated (in the future).

- excerpt from Macdiarmid F., B.A. Bensley and C.A. Candee. 1930. Report of Special Committee on the Game Fish Situation. Legislative Assembly of Ontario Sessional Paper, No. 54. pp. 12-16. Printed and Published by Herbert H. Ball, Printer to the King's Most Excellent Majesty.

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ABSTRACT

In 1984, the Rideau Lakes Fisheries Assessment Unit conducted a stratified roving creel survey on Mica, Opinicon, Sydenham, and Upper Rideau Lakes during the smallmouth and largemouth bass open season. This survey is part of a long term program designed to provide both qualitative and quantitative information on the sport fisheries of the Unit's five warmwater type lakes, ie. estimates of catch, harvest, effort, and angler success; length, weight, and age structures of the harvest; fishing methods; and user group characteristics (MacLean and Smith 1981). The CREESYS microcomputer program (version 3.1) was used for data analysis.

Survey results were interpreted in light of several indices of overexploitation; 1982 creel data; and population characteristics ascertained from index trapnetting.

Estimated angling pressure on the five lakes varied considerably, ranging from 0.0 rod-hours per hectare on Mica Lake to 31.4 rod-hours per hectare on Opinicon Lake. The estimated sport fishery yield on all lakes was lower than the potential yield calculated from the morphoedaphic index (Ryder 1965). However, several species exhibited signs of overexploitation, ie. northern pike and smallmouth bass on Sydenham Lake; and yellow perch on Upper Rideau.

1. INTRODUCTION

In 1981, the Rideau Lakes Fisheries Assessment Unit (RLFAU) initiated a long-term survey program to assess the sport fisheries of Mica, Opinicon, Sydenham, and Upper Rideau Lakes during the largemouth and smallmouth bass open seasons (MacLean and Smith 1981).

The program is designed to provide both qualitative and quantitative sport fishery data for trend-through-time analysis. Information to be gathered includes:

1) estimates of catch, harvest, effort, and angler success rates,
2) length, weight, and age structures of the harvest,
3) fishing methods, and
4) user-group characteristics.

This report summarizes the results of the 1984 summer creel survey and examines trends in light of several indices of overexploitation.

2. THE STUDY AREA

The four RLFAU type lakes included in this survey are situated along the Rideau Corridor (Figure 2.1) in Divisions 9 and 10 of the Ontario Fishery Regulations (Ontario Ministry of Natural Resources MNR 1984a).

MacLean and Hooper (1981) examined the physical, chemical, and biological characteristics of each lake in detail (Table 2.1). In 1983, a Fisheries Special Employment Project, co-ordinated through this office, repeated the lake survey mapping and depth sounding for all 10 Unit lakes. Limnological data were adjusted only if recalculated values varied from background data by > 5%. As such, the area, mean depth, morphoedaphic index (MEI) and yield estimate for Sydenham Lake have been revised.

Table 2.1 Characteristics of the four study lakes (from MacLean and Hooper 1981).

Lake	Lake Community	Area (ha)	Mean Depth (m)	TDS	T/O2	MEI (ppm/m)	Yield	Stresses Fishing	Stresses EAWPI
Mica	0404	23.9	1.4	140.5	NST	100.4	10.78	010	00000
Opinicon	0604	786.7	2.5	122.0	NST	48.8	7.81	031	10111
Sydenham	0604	709.1	7.8	168.0	SLO	21.6	5.43	030	10010
Upper Rideau	0704	1362.8	8.1	150.0	SLO	18.5	5.07	031	10111

Definition of columns:

Lake Community: First two columns = major community. 04 = northern pike; 06 = northern pike - smallmouth bass; 07 = northern pike - smallmouth bass - walleye. Last two columns = minor community. 04 = largemouth bass.

Area = surface area in hectares (ha).

Mean Depth = mean depth in meters (m).

TDS = total dissolved solids (mg/l) based on the lowest observed summer conductivity (Smith and MacLean 1985).

T/O2 = temperature/oxygen; ie. SLO = stratified, low oxygen; SHO = stratified, high oxygen; NST = not stratified

MEI = metric morphoedaphic index (ppm/m).

Yield = Ryder's annual yield estimate for Northern Great Lakes - St. Lawrence watershed (in kg/ha/yr) (MNR 1982).

Stresses = Fishing: first column = no exploitation, second column = sport exploitation and third column = commercial exploitation; where 0 = none, 1= low, 2 = medium, 3 = high.
Other: presence = 1 or absence = 0, of E = eutrophication, A = acidification, W = water levels, P = physical alterations and I = introductions. (Note: here introductions refer to exotic species. Various game fish have been successfully introduced to these waters in the past).

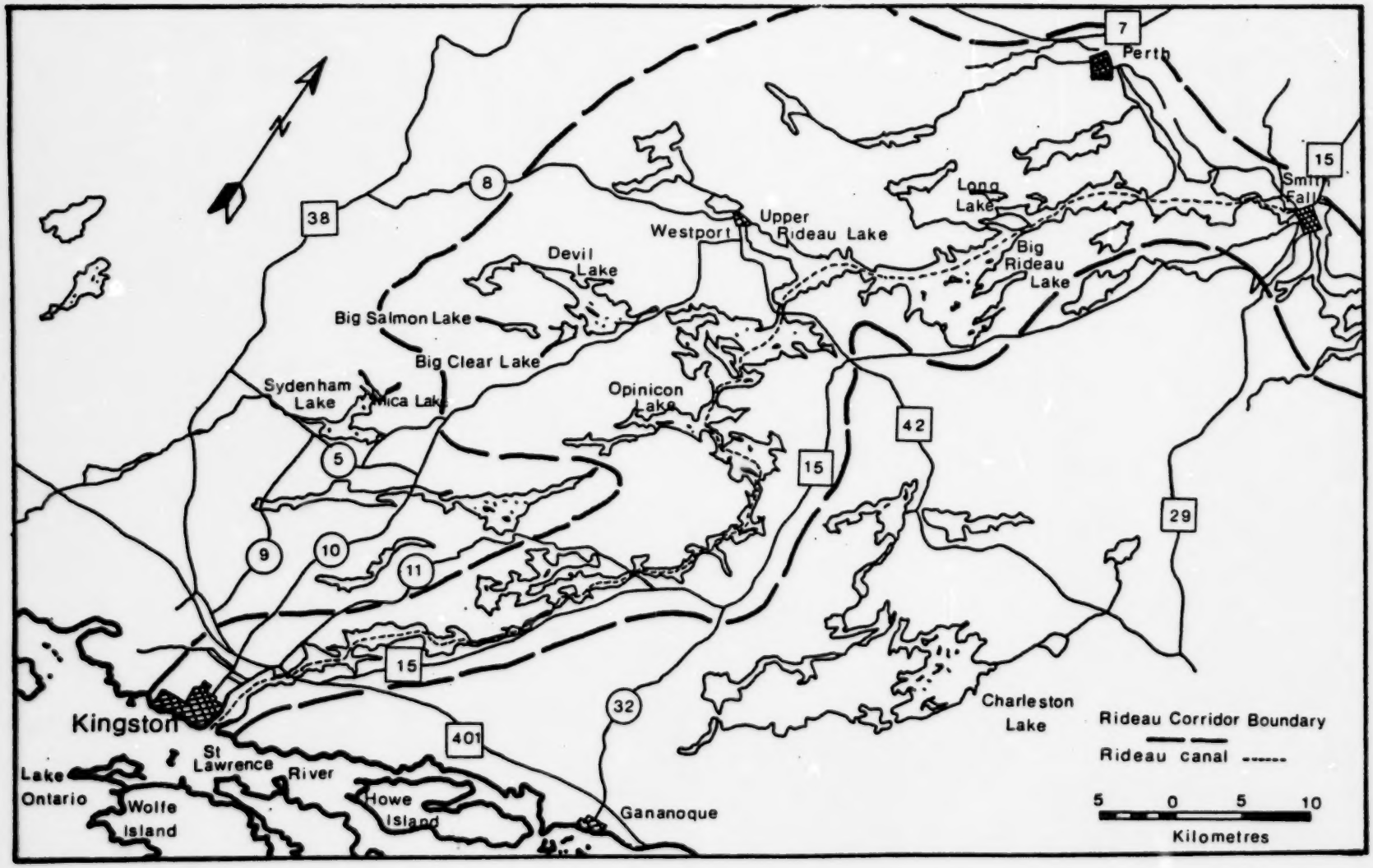


Figure 2.1 The Rideau Corridor and 10 RLFAU type lakes (after CORTS 1971).

3. METHODS

The RLFAU uses a roving creel methodology with spatial and temporal stratification. The CREESYS computer package (version 3.1) was used for data analysis (MNR 1984b). CREESYS produces the same results as the computerized data analysis program used by the RLFAU prior to 1984 (Petzold 1980). As such, the results presented in this report are directly comparable to 1982 data (Schlesinger et al 1984).

3.1 CREEL CENSUS DESIGN

The bass season in Division 10 opens the last Saturday in June and closes October 15; while in Division 9, the season extends until November 30.

Previous surveys have shown that angling effort in Division 9 from October 15 to November 30 is insignificant (Schlesinger et al. 1984). As such, the 1984 summer creel survey was conducted from June 30 to October 15 on all lakes.

Basically, the survey involved estimating fishing effort via angler counts, interviewing anglers, and sampling the harvest. The census was stratified by area, day-type and time-period (Table 3.1, Appendix 8.1).

Census days were scheduled so that two technicians could sample all four lakes. Weekend days were not stratified by time-period due to the short season. Overall, 32% of available weekdays and 46% of available weekend-days were sampled on each lake.

As the 1982 creel survey found very light fishing pressure on Mica Lake, we chose to sample the lake in conjunction with Sydenham Lake. The creel technician routinely travelled 0.4 km overland to check Mica Lake after interviewing anglers in Area 3 of Sydenham Lake (Figure 2.1, Appendix 8.1).

3.2 CENSUS PROCEDURE

Pressure counts were carried out to determine the mean number of anglers present within specific strata. These counts, combined with interview information, provided estimates of catch, harvest and effort. Three counts were completed during most census periods: an instantaneous count for all areas, a progressive count after interviewing anglers in each area, and a final instantaneous count.

Angler interviews provided data on party size, fishing methods, angler origin and fishing success. The frequency of interviews per sampling period was not predetermined. Technicians organized their interview time to obtain the maximum number of random interviews in each area. Interview time per area was apportioned on the basis of the first instantaneous count. Scale samples, length, and weight measurements were collected randomly from harvested northern pike, rock bass, smallmouth and largemouth bass, yellow perch and walleye.

Throughout this report, our use of common names follows Bailey et al. (1970).

3.3 DATA ANALYSIS

3.3.1 Catch, harvest and effort estimates

The CREESYS computer program uses observed data to derive daily estimates of catch, harvest and effort. These estimated values are summed and expanded into stratum estimates.

(Note: In the following tables the sum of catch, harvest or effort estimates for individual strata does not always equal the combined strata estimates due to rounding error).

Standard errors (SE) for estimates of total catch, harvest and effort were calculated from the variability among daily estimates. The within-day variability was assumed to be small compared to the among day variability and was not included in the variance formula. A SE could not be calculated for any given stratum with less than two sample days. In such cases, a value of zero was arbitrarily assigned, resulting in an underestimated SE for any summary including this stratum.

Yield (as weight in kg) was calculated by multiplying the mean weight of the sample of a particular species by the estimated harvest. The variance of the product was calculated as:

$$s^2 = (x.y)^2\left(\frac{s_{x^2}}{x^2} + \frac{s_{y^2}}{y^2}\right)$$

where x and y are the mean weight and harvest respectively, having variances s_{x^2} and s_{y^2} (Freese 1979).

Catch-per-unit of effort (CUE) was expressed as the catch per rod-hour in both observed and estimated forms. Observed CUEs were calculated for "all anglers" by dividing the observed catch of a species by the observed total number of rod-hours expended by all anglers. Observed CUEs for "species-specific anglers" were calculated by dividing the observed catch of a species by the rod-hours expended by anglers seeking that particular species. (Throughout this report, observed CUEs are used as a measure of both relative abundance and angler success.)

Estimated CUEs were calculated for "all anglers" by dividing the total estimated catch of a species by the total estimated effort expended by all anglers, and for species-specific anglers by dividing the total estimated catch of a species by the total estimated effort expended by anglers seeking that particular species. The estimated CUEs were calculated to compensate for varying amounts of effort expended on each sampling day and are more representative of the general angling experience (Petzold 1980). Values for harvest-per -unit of effort (HUE) were also calculated in the above manner.

All statistical testing was done at the 95% significance level unless stated otherwise.

3.3.2 Age, length and weight

The age, fork length, and weight distributions for all species sampled have been presented.

3.3.3 Fishing methods and user-group data

CREESYS reports the frequency of occurrence for various fishing methods, angler origin, and visitor-type encountered (MNR 1984b). This data is summarized for each lake.

3.3.4 Observed yield in relation to potential yield

MNR (1983) suggested guidelines to partition the overall potential yield calculated from the MEI (Ryder 1965) into allowable commercial and angling yields. Exploitation levels were recommended for seven fish species including northern pike, smallmouth bass, yellow perch and walleye. We have compared the recommended and actual percent exploitation levels and yields for each species and calculated both the relative yield index (RYI) (Adams and Olver 1977) and the ratio of observed to recommended yield (RORY) (Schlesinger and MacLean 1983).

3.3.5 Total mortality rate

We have calculated total mortality rates for major sport species using catch curves (Ricker 1975). MNR 1983 reports that a total mortality rate greater than 50% for smallmouth bass and 65% for northern pike may be indicative of overexploitation.

Table 3.1 Design of the June 30 - October 15, 1984 creel census.

Lake	Area	Season	Day-type	Time-period
Mica Lake	1	1,2,3	1,2	1,2,3
Opinicon Lake	1,2,3	1,2,3	1,2	1,2,3
Sydenham Lake	1,2,3	1,2,3	1,2	1,2,3
Upper Rideau Lake	1,2,3	1,2,3	1,2	1,2,3

Definition of columns:
Area: number = lake from Appendix B.1
Season: 1 = June 30 - July 31; 2 = August 1 - September 3;
3 = September 4 - October 15.
Day-type: 1 = weekday; 2 = weekend-day
Time-period: 1 = 0600-1300h; 2 = 1300-2000h; 3 = 1300-1900.

4. RESULTS AND DISCUSSION

4.1 MICA LAKE

4.1.1 Summer creel census, 1984

Mica Lake was creeled on 40 sample days between June 31 and October 15, 1984. No fishing effort was observed during the scheduled creel; however, two anglers were interviewed by our index netting crew.

Biological data for their catch are summarized below:

Species	Total Length (cm)	Fork Length (cm)	Weight (g)	Age (yr)
Northern pike	53.4	50.0	750	3
Northern pike	71.0	66.9	1475	7

4.2 OPINICON LAKE

4.2.1 Summer creel census, 1984

Eight hundred and two anglers (379 parties) were interviewed during 40 sampling days.

Distribution of angling effort - An estimated 24,660 rod-hr (31.4 rod-hr/ha) were exerted during the 108-day survey (Table 4.1).

Seasonally, most angling effort was expended in June/July and the least in September/October. This was also the case for mean daily effort. Spatially, Area 2 received the most effort (Tables 4.2 and 4.3).

The total angling effort was greater on weekdays than on weekend-days. However, the average weekend-day effort was greater than the average weekday effort. Angling effort was slightly greater in the afternoons than in the mornings during both weekdays and weekend-days (Table 4.2).

Largemouth bass were the most sought after species in the fishery, both seasonally and spatially. Considerable angling effort was also directed towards northern pike and smallmouth bass (Tables 4.4 and 4.5).

Total catch and harvest - An estimated 14,393 fish comprising 10 species were caught, of which 4,884 were harvested. Largemouth bass dominated both the catch and harvest. Northern pike, black crappie and smallmouth bass were also prominent in the harvest (Table 4.1).

The northern pike fishery - The observed CUE and HUE for species-specific anglers were 0.227 and 0.117 fish-rod/hr respectively (Table 4.1).

Seasonally, pike fishermen were most successful in August/September. Spatially, Area 2 had the highest CUE (Table 4.6).

Overall, an estimated 2,483 pike were caught, of which 681 were harvested (Table 4.1). The greatest number of pike were caught in June/July. Area 2 provided the greatest catch (Table 4.9).

The mean total length (+/- 95% confidence limit) of the 16 pike examined was 58.0 +/- 3.7 cm; mean fork length was 54.9 +/- 3.6 cm; and mean weight was 1039 +/- 259 g (Figure 4.1).

Northern pike entered the Opinicon Lake fishery (harvest) at age II and the oldest fish caught was age VII. The mean age of the harvested fish was 4.3 +/- 0.8 years (Figure 4.1).

The estimated yield of northern pike for the 1984 summer fishery was 0.90 +/- 0.41 kg/ha.

The smallmouth bass fishery - The observed CUE and HUE for species-specific anglers were 0.215 and 0.071 fish rod/hr respectively (Table 4.1).

Seasonally, smallmouth bass angler CUE was highest in

August/September. Spatially, Area 2 provided the best fishing (Table 4.7).

Overall, an estimated 748 smallmouth bass were caught of which 123 were harvested (Table 4.1). The greatest number of smallmouth bass were caught in June/July. Area 2 produced the greatest catch (Table 4.10).

The estimated smallmouth bass yield for the 1984 summer sport fishery was 0.11 kg/ha.

The largemouth bass fishery - The observed CUE and HUE for species-specific anglers were 0.271 and 0.120 respectively (Table 4.1). There was a considerable difference in the observed CUE and HUE between guided and non-guided fishing parties, ie. 0.605 and 0.286 for guided parties vs. 0.225 and 0.097 for unguided.

Seasonally, largemouth bass anglers were most successful in June/July. Spatially, Area 3 had the highest CUE (Table 4.8).

Overall, an estimated 6,931 fish were caught of which 3,380 were harvested (Table 4.1). The greatest number of largemouth bass were caught in August/September. Area 2 had the largest catch (Table 4.11).

The mean total length of the 49 largemouth bass sampled was 37.6 +/- 1.6 cm; mean fork length was 36.1 +/- 1.5 cm; and mean weight 876 +/- 145 g (Figure 4.2).

Largemouth bass entered the Opinicon Lake fishery at age V and the oldest fish caught was age XVI. The mean age of the harvested fish was 8.1 +/- 0.8 years (Figure 4.2).

The estimated largemouth bass yield for the 1984 summer sport fishery was 3.76 +/- 1.05 kg/ha.

Other fisheries - The estimated harvest of other 'non-sport' fish species included 120 brown bullhead, 529 black crappie, and 51 yellow perch (Table 4.1). These species were not sampled.

Fishing methods, user-group information - The mean number of rods/angling party was 2.13. Sixty-nine percent of the anglers interviewed fished by spin-casting, 13% still fished, 13% drifted, and 6% trolled. Twelve percent of the anglers interviewed were guided.

Ninety percent of the anglers interviewed were residents of the United States, 7% were non-local Ontario residents, 3% of the anglers were local residents, and 1% were out-of-province Canadian residents.

The breakdown of visitor-types was as follows: 1% permanent residents; 9% non-permanent residents; 2% daytrippers; <1% campers (provincial park); 3% campers (commercial); 0% campers (crown); 82% other (paid); 4% other (non-paid).

4.2.2 Biological characteristics of the harvest

The estimated yield of the major species for the Opinicon

yield predicted from the MEI (7.81 kg/ha). There is also a small harvest of black crappies and other course species which is not included in this total (Table 4.12). Northern pike and smallmouth bass yields fall within recommended levels.

The mean ages at harvest for northern pike, smallmouth bass, and largemouth bass all exceed the age at maturity for these species cited in Scott and Crossman (1973).

Total mortality rates for the major species are: northern pike, 0.28 (ages 3-7); and largemouth bass, 0.20 (ages 7-16). Both of these rates fall within recommended levels (MNR 1983).

Table 4.1 Summary of catch, harvest and effort data from the creel census conducted on Dainican Lake during the June 30 - October 15, 1984 open season. Values in parentheses are standard errors.

ALL ANGLERS

Species	# Anglers[1]	OBSERVED Catch (#)	Harvest (#)	Effort (rod-hr)	CUE (#/rod-hr)	HUE (#/rod-hr)	ESTIMATED Catch (#)	Harvest (#)	Effort (rod-hr)	CUE (#/rod-hr)	HUE (#/rod-hr)
Northern pike	802	150	37	1550	0.096	0.024	2483 (405)	681 (152)	24660 (1581)	0.100	0.028
Brown bullhead	802	30	4	1550	0.019	0.003	550 (150)	120 (70)	24660 (1581)	0.022	0.005
Sunfish	802	28	0	1550	0.018	0.000	405 (276)	0 (0)	24660 (1581)	0.016	0.000
Rock bass	802	84	0	1550	0.054	0.000	1327 (596)	0 (0)	24660 (1581)	0.053	0.000
Pumpkinseed	802	6	0	1550	0.003	0.000	111 (79)	0 (0)	24660 (1581)	0.004	0.000
Bluegill	802	37	0	1550	0.023	0.000	354 (175)	0 (0)	24660 (1581)	0.014	0.000
Smallmouth bass	802	43	7	1550	0.027	0.005	748 (189)	123 (54)	24660 (1581)	0.030	0.005
Largemouth bass	802	405	178	1550	0.261	0.115	6931 (770)	3380 (472)	24660 (1581)	0.281	0.137
Black crappie	802	46	20	1550	0.029	0.013	1364 (685)	529 (366)	24660 (1581)	0.055	0.021
Yellow perch	802	8	3	1550	0.005	0.002	120 (62)	51 (23)	24660 (1581)	0.004	0.002

SPECIES SPECIFIC ANGLERS

Species	# Anglers[1]	OBSERVED Catch (#)	Harvest (#)	Effort (rod-hr)	CUE (#/rod-hr)	HUE (#/rod-hr)	ESTIMATED Catch (#)	Harvest (#)	Effort (rod-hr)	CUE (#/rod-hr)	HUE (#/rod-hr)
Northern pike	150	66	34	290	0.227	0.117	997 (215)	540 (122)	4603 (693)	0.216	0.117
Bullhead	2	0	0	2	0.000	0.000	0 (0)	0 (0)	44 (40)	0.000	0.000
Smallmouth bass	50	21	7	98	0.215	0.071	472 (169)	131 (58)	1576 (369)	0.299	0.083
Largemouth bass	732	403	178	1485	0.271	0.120	6805 (770)	3302 (464)	22822 (1543)	0.298	0.145
Black crappie	3	25	15	9	2.637	1.667	533 (482)	319 (289)	202 (182)	2.637	1.579

[1]379 parties were interviewed.

Table 4.2 Distribution of estimated angling effort (rod-hr) for all anglers by season, day-type, and time period during the June 30 to October 15, 1984 bass open season on Opinicon Lake.
Values in parentheses are percentages of the grand total.

Season	Weekday		Weekend-day		Total
	AM	PM	AM	PM	
June 30 - July 31	3598	4089	2514	2502	12703 (51.5)
Aug. 1 - Sept. 3	2018	3211	1260	1564	8053 (32.7)
Sept. 4 - Oct. 15	1128	1554	578	644	3904 (15.8)
Study Period	6744 (27.8)	8854 (35.9)	4352 (17.6)	4710 (19.1)	24660 (100.0)
AM + PM	15598 (63.3)		9062 (36.7)		
Mean daily effort[1]	205.2		283.2		

[1]The study period included 76 weekdays and 32 weekend-days.

Table 4.3 Distribution of estimated angling effort (rod-hr) for all anglers by season, and area during the June 30 to October 15, 1984 bass open season on Opinicon Lake.
Values in parentheses are percentages of the grand total.

Season	Area			Total	Mean Daily Effort[1]
	1	2	3		
June 30 - July 31	2888	7209	2606	12703 (51.5)	397.0
Aug. 1 - Sept. 3	1533	4909	1611	8053 (32.7)	236.9
Sept. 4 - Oct. 15	611	2373	920	3904 (15.8)	93.0
Study Period	5032 (20.4)	14491 (58.8)	5137 (20.8)	24660 (100.0)	228.3

[1]The 1st season was 32 days long; 2nd season, 34 days; 3rd season, 42 days.

Table 4.4 Percentage of the total estimated effort (rod-hr) expended by anglers seeking a particular species, by area, during the June 30 to October 15, 1984 bass open season on Opinicon Lake.

Species	Area[1]			All Areas
	1	2	3	
Northern pike	11.3	27.8	0.2	18.7
Bullhead	0.9	0.0	0.0	0.2
Smallmouth bass	6.4	7.4	3.6	6.4
Largemouth bass	98.0	88.3	99.2	92.5
Black crappie	0.0	1.4	0.0	0.8

[1]In some cases anglers sought more than one species, while others indicated no preference. As a result, columns may not add up to 100%.

Table 4.5 Percentage of the total estimated effort (rod-hr) expended by anglers seeking a particular species, by season, during the June 30 to October 15, 1984 bass open season on Opinicon Lake.

Species	Season[1]			All Seasons
	June 30-July 31	Aug. 1-Sept. 3	Sept. 4-Oct. 15	
Northern pike	17.5	21.8	16.0	18.7
Bullhead	0.0	0.5	0.0	0.2
Smallmouth bass	7.9	4.3	5.7	6.4
Largemouth bass	95.2	89.9	89.5	92.5
Black crappie	0.0	2.5	0.0	0.8

[1]In some cases anglers sought more than one species, while others indicated no preference. As a result, columns may not add up to 100%.

Table 4.6 Observed CUE for northern pike anglers by season and area during the June 30 to October 15, 1984 bass open season on Opinicon Lake. Blanks denote no recorded effort.

Season	Area			All Areas
	1	2	3	
June 30 - July 31	0.117	0.237	0.000	0.214
Aug. 1 - Sept. 3	0.000	0.297		0.270
Sept. 4 - Oct. 15		0.105		0.105
Study Period	0.082	0.248	0.000	0.227

Table 4.7 Observed CUE for smallmouth bass anglers by season and area during the June 30 to October 15, 1984 bass open season on Opinicon Lake.

Season	Area			All Areas
	1	2	3	
June 30 - July 31	0.000	0.205	0.133	0.133
Aug. 1 - Sept. 3	0.000	0.604	0.000	0.540
Sept. 4 - Oct. 15		0.273	0.166	0.225
Study Period	0.000	0.310	0.131	0.215

Table 4.8 Observed CUE for largemouth bass anglers by season and area during the June 30 to October 15, 1984 bass open season on Opinicon Lake.

Season	Area			All Areas
	1	2	3	
June 30 - July 31	0.256	0.335	0.406	0.324
Aug. 1 - Sept. 3	0.266	0.224	0.206	0.227
Sept. 4 - Oct. 15	0.333	0.168	0.079	0.172
Study Period	0.267	0.271	0.276	0.271

Table 4.9 Distribution of estimated northern pike catch for all anglers by season and area during the June 30 to October 15, 1984 bass open season on Opinicon Lake.
Values in parentheses are percentages of the grand total.

Season	Area			All Areas	Percent Harvested
	1	2	3		
June 30 - July 31	167	680	348	1195 (48.2)	30.6
Aug. 1 - Sept. 3	17	700	15	732 (29.5)	31.7
Sept. 4 - Oct. 15	119	409	24	552 (22.3)	14.8
Study Period	303 (12.2)	1789 (72.1)	387 (15.6)	2479 (100.0)	27.4

Table 4.10 Distribution of estimated smallmouth bass catch for all anglers by season and area during the June 30 to October 15, 1984 bass open season on Opinicon Lake.
Values in parentheses are percentages of the grand total.

Season	Area			All Areas	Percent Harvested
	1	2	3		
June 30 - July 31	22	307	78	407 (54.6)	11.0
Aug. 1 - Sept. 3	17	239	0	256 (34.4)	23.4
Sept. 4 - Oct. 15	18	53	11	89 (11.0)	19.3
Study Period	57 (7.7)	599 (80.4)	89 (11.9)	745 (100.0)	16.4

Table 4.11 Distribution of estimated largemouth bass catch for all anglers by season and area during the June 30 to October 15, 1984 bass open season on Opinicon Lake.
Values in parentheses are percentages of the grand total.

Season	Area			All Areas	Percent Harvested
	1	2	3		
June 30 - July 31	1026	2167	1366	4559 (65.8)	48.4
Aug. 1 - Sept. 3	416	1032	247	1703 (24.6)	52.0
Sept. 4 - Oct. 15	186	384	96	667 (9.6)	43.5
Study Period	1628 (23.5)	3590 (51.8)	1709 (24.7)	6929 (100.0)	48.8

Table 4.12 The recommended maximum and estimated exploitation levels and yields for target species during the 1984 Opinicon Lake sport fishery.
Ryder's potential yield = 7.81 kg/ha/yr.
NG denotes no guidelines.

Species	Recommended Maximum Exploitation Level (%)	Estimated Exploitation Level (%)	Recommended Maximum Species Yield (kg/ha/yr)	Estimated Species Yield (kg/ha/yr)	RORY
Northern pike	25	12	1.95	0.90	0.46
Smallmouth bass	17-50	1	1.32-3.91	0.11	0.03-0.08
Largemouth bass	NG	NG	NG	3.76	NG
Yellow perch	13	0.2	1.02	0.02	0.02

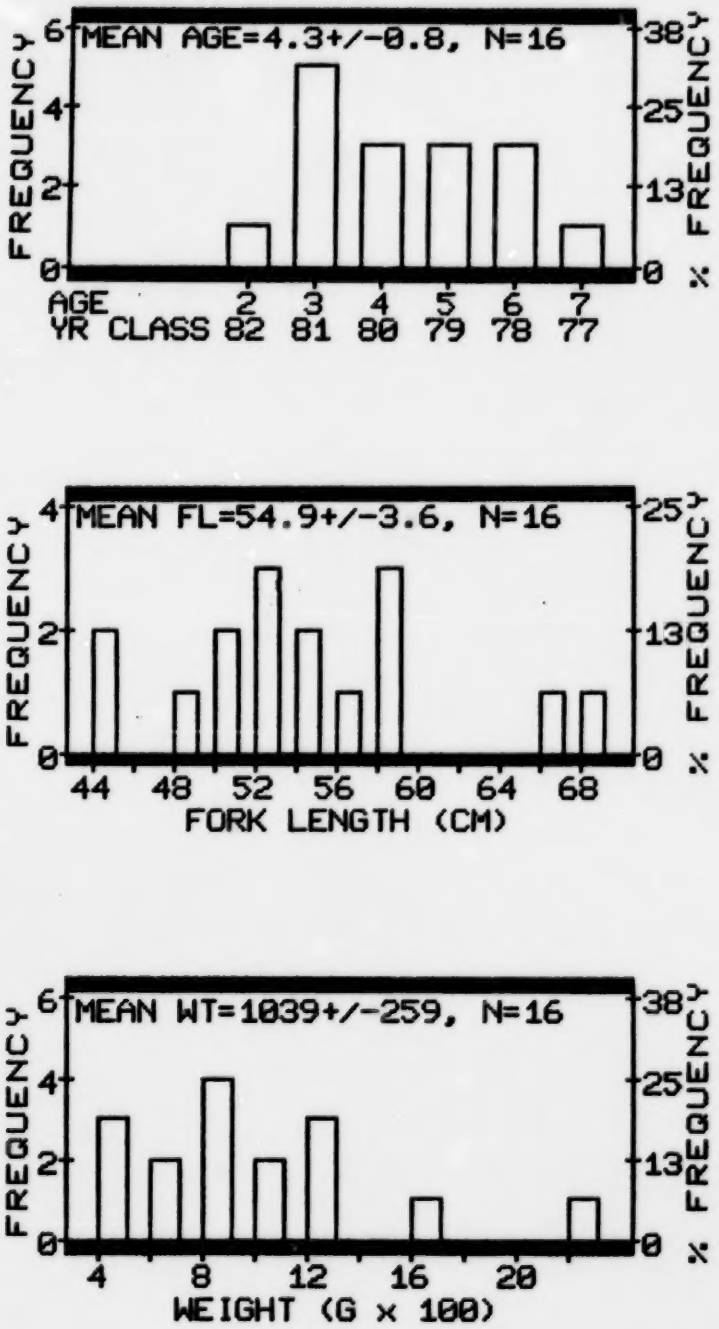


Figure 4.1 Age, length, and weight distributions for northern pike sampled during the 1984 summer sport fishery on Opinicon Lake.

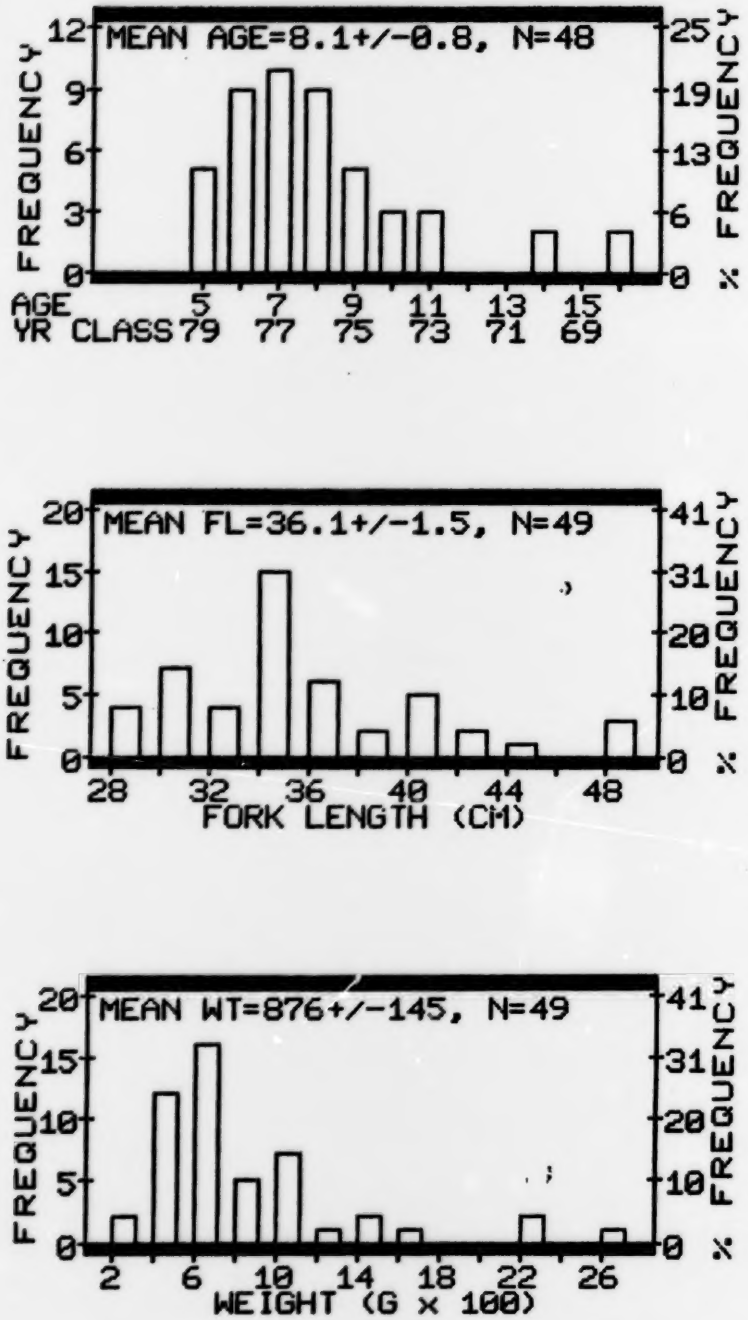


Figure 4.2 Age, length, and weight distributions for largemouth bass sampled during the 1984 summer sport fishery on Opinicon Lake.

4.3 SYDENHAM LAKE

4.3.1 Summer creel census, 1984

Eight hundred and three anglers (399 parties) were interviewed during 40 sampling days.

Distribution of angling effort - An estimated 19,448 rod-hr (27.4 rod-hr/ha) were exerted during the 108-day survey (Table 4.13).

Seasonally, most angling effort was expended in June/July and the least in September/October. This is also the case with mean daily effort. Spatially, Area 2 received the most effort; Area 1 the least (Tables 4.14 and 4.15).

The total angling effort was almost evenly divided between weekdays and weekend-days. However, average weekend-day effort was over twice as great as the average weekday effort. Angling effort was greater in the mornings during weekdays, but was similar in the mornings and afternoons on weekend-days (Table 4.14).

Largemouth bass were the most sought-after species in all three areas of Sydenham Lake. The smallmouth bass was also a very popular game fish. As the season progressed angling effort for northern pike increased dramatically (Tables 4.16 and 4.17).

Total catch and harvest - An estimated 33,431 fish comprising 10 species were caught, of which 8,350 were harvested. Rock bass were the most numerous fish caught, although only 8.8% were kept. Largemouth bass dominated the harvest followed by northern pike, brown bullhead, and smallmouth bass (Table 4.13).

The northern pike fishery - The observed CUE and HUE for species-specific anglers were 0.291 and 0.099 fish-rod/hr respectively (Table 4.13).

Seasonally, pike fishermen were most successful in September/October. Spatially, Area 1 had the highest CUE (Table 4.18).

Overall an estimated 4,860 pike were caught, of which 1,191 were harvested (Table 4.13). The greatest number of pike were caught in August/September. Area 3 provided the greatest catch (Table 4.21).

The mean total length (+/- 95% confidence limits) of the 50 pike examined was 55.3 +/- 2.2 cm; mean fork length was 52.6 +/- 2.1 cm; and mean weight was 959 +/- 113 g (Figure 4.3).

Northern pike entered the Sydenham Lake fishery (harvest) at age II and the oldest fish caught was age VII. The mean age of the harvested fish was 4.2 +/- 0.3 years (Figure 4.3).

The estimated yield of northern pike for the 1984 summer fishery was 1.61 +/- 0.73 kg/ha.

The smallmouth bass fishery - The observed CUE and HUE for species-specific anglers were 0.223 and 0.066 fish rod/hr respectively (Table 4.13).

Seasonally, smallmouth bass anglers were most successful in June/July. Spatially, Area 1 again had the highest CUE (Table 4.19).

Overall, an estimated 3,512 smallmouth bass were caught of which 945 were harvested (Table 4.13). The greatest number of smallmouth bass were caught in June/July. Area 2 produced the greatest catch (Table 4.22).

The mean total length of the 41 smallmouth bass sampled was 28.8 +/- 1.7 cm; mean fork length was 27.2 +/- 1.5 cm; and mean weight was 353 +/- 67 g (Figure 4.4).

Smallmouth bass entered the Sydenham Lake fishery at age II and the oldest fish caught was age VI. The mean age of the harvested fish was 3.3 +/- 0.4 years (Figure 4.5).

The estimated smallmouth bass yield for the 1984 summer sport fishery was 0.47 +/- 0.14 kg/ha.

The largemouth bass fishery - The observed CUE and HUE for species-specific anglers were 0.372 and 0.139 respectively (Table 4.13).

Seasonally, largemouth bass anglers were most successful in June/July. Spatially, Area 3 had the highest CUE (Table 4.20).

Overall, an estimated 6,646 fish were caught of which 2,298 were harvested (Table 4.13). The greatest number of largemouth bass were caught in June/July. Area 2 produced the greatest catch (Table 4.23).

The mean total length of the 51 largemouth bass sampled was 32.9 +/- 1.9 cm; mean fork length was 31.4 +/- 1.8 cm; and mean weight 630 +/- 119 g (Figure 4.5).

Largemouth bass entered the Sydenham Lake fishery at age II and the oldest fish caught was age X. The mean age of the harvested fish was 4.5 +/- 0.5 years (Figure 4.5).

The estimated largemouth bass yield for the 1984 summer sport fishery was 2.04 +/- 0.59 kg/ha.

Other fisheries - The estimated harvest of other 'non-sport' fish species included 977 brown bullhead, 757 rock bass, 606 bluegill, 765 black crappie, 284 yellow perch, and 527 unidentified sunfish (Table 4.13).

The mean fork length of the 22 rock bass sampled was 19.9 +/- 1.5 cm; mean weight, 187 +/- 45 g; and mean age, 6.9 +/- 3.7 years (Figure 4.6). The mean fork length of the 12 yellow perch sampled was 20.8 +/- 1.7 cm; mean weight was 106 +/- 20 g; and mean age, 5.9 +/- 0.6 years (Figure 4.7).

The estimated yields of rock bass and yellow perch for the 1984 summer fishery were 0.20 +/- 0.12 and 0.04 +/- 0.03 kg/ha, respectively.

Fishing methods, user-group information - The mean number of rods/angling party was 2.12. Fifty-six percent of the anglers interviewed fished by spin-casting, 24% still fished, 13% trolled, and 8% drifted.

Sixty-one percent of the anglers interviewed were resident of the United States, 27% of the anglers were local residents, 12% were non-local Ontario residents, and 1% were out-of-province

Canadian residents.

The breakdown of visitor-types was: 4% permanent residents; 5% non-permanent residents; 11% daytrippers; <1% campers (provincial); 33% campers (commercial); 0% campers (crown); 43% other (paid); and 4% other (non-paid).

4.3.2 Biological characteristics of the harvest

The estimated yield of the major species for the Sydenham Lake summer fishery was 4.12 kg/ha or 76% of the annual potential yield predicted from the MEI (5.43 kg/ha). However, there is a significant harvest of panfish which is not included in this total (Table 4.24). The ratio of observed to recommended yield for northern pike is approximately 1.2. Smallmouth bass and yellow perch yields fall within recommended levels.

The mean age at harvest for smallmouth bass was 3.3 years and is less than the age at maturity (4-5 years) cited by Scott and Crossman (1973). The mean ages at harvest for northern pike, largemouth bass, yellow perch and rock bass all exceed the age at maturity for these species.

Total mortality rates for major sport species are: northern pike, 0.60 (ages 4-7); smallmouth bass, 0.70 (ages 4-6); and largemouth bass, 0.34 (ages 3-10).

Table 4.13 Summary of catch, harvest and effort data from the creel census conducted on Sydenham Lake during the June 30 - October 15, 1984 open season. Values in parentheses are standard errors.

ALL ANGLERS

Species	# Anglers	OBSERVED Catch (#)	Harvest (#)	Effort (rod-hr)	CUE (#/rod-hr)	HUE (#/rod-hr)	ESTIMATED Catch (#)	Harvest (#)	Effort (rod-hr)	CUE (#/rod-hr)	HUE (#/rod-hr)
Northern pike	803	431	87	1679	0.256	0.052	4860 (652)	1191 (270)	19448 (1448)	0.249	0.061
Brown bullhead	803	164	78	1679	0.097	0.046	2229 (688)	977 (392)	19448 (1448)	0.114	0.050
Sunfish	803	86	22	1679	0.051	0.013	1817 (816)	527 (392)	19448 (1448)	0.093	0.027
Rock bass	803	680	44	1679	0.405	0.026	8654 (1312)	757 (235)	19448 (1448)	0.445	0.039
Pumpkinseed	803	51	0	1679	0.030	0.000	533 (162)	0 (0)	19448 (1448)	0.027	0.000
Bluegill	803	91	18	1679	0.054	0.011	1839 (888)	606 (503)	19448 (1448)	0.094	0.031
Smallmouth bass	803	265	76	1679	0.157	0.045	3512 (498)	945 (142)	19448 (1448)	0.180	0.049
Largemouth bass	803	528	196	1679	0.314	0.117	6646 (847)	2299 (328)	19448 (1448)	0.341	0.118
Black crappie	803	85	37	1679	0.050	0.022	1720 (826)	765 (384)	19448 (1448)	0.088	0.039
Yellow perch	803	130	18	1679	0.077	0.010	1622 (404)	284 (97)	19448 (1448)	0.083	0.015
Walleye	803	0	0	1679	0.000	0.000	0 (0)	0 (0)	19448 (1448)	0.000	0.000

SPECIES SPECIFIC ANGLERS

Species	# Anglers	OBSERVED Catch (#)	Harvest (#)	Effort (rod-hr)	CUE (#/rod-hr)	HUE (#/rod-hr)	ESTIMATED Catch (#)	Harvest (#)	Effort (rod-hr)	CUE (#/rod-hr)	HUE (#/rod-hr)
Northern pike	288	194	66	665	0.291	0.099	2611 (468)	951 (264)	6349 (735)	0.411	0.150
Brown bullhead	17	18	4	32	0.562	0.125	446 (274)	81 (38)	484 (186)	0.921	0.167
Sunfish	2	21	11	9	2.453	1.222	134 (120)	70 (63)	40 (21)	3.302	1.750
Rock bass	36	50	15	70	0.710	0.214	689 (243)	165 (86)	620 (181)	1.109	0.266
Pumpkinseed	7	2	0	10	0.192	0.000	56 (48)	0 (0)	166 (101)	0.336	0.000
Bluegill	10	29	8	12	2.474	0.667	473 (258)	93 (71)	165 (79)	2.854	0.564
Smallmouth bass	477	245	72	1095	0.223	0.066	3250 (551)	840 (118)	10555 (871)	0.307	0.080
Largemouth bass	584	500	187	1343	0.372	0.139	5953 (788)	2075 (313)	14433 (1379)	0.412	0.144
Black crappie	8	33	8	11	2.981	0.727	872 (747)	215 (172)	231 (172)	3.761	0.931
Yellow perch	8	10	2	18	0.541	0.111	109 (59)	33 (23)	123 (48)	0.888	0.268
Walleye	3	0	0	9	0.000	0.000	0 (0)	0 (0)	70 (60)	0.000	0.000

[1]399 parties were interviewed.

Table 4.14 Distribution of estimated angling effort (rod-hr) for all anglers by season, day-type, and time period during the June 30 to October 15, 1984 bass open season on Sydenham Lake.
Values in parentheses are percentages of the grand total.

Season	Weekday		Weekend-day		Total
	AM	PM	AM	PM	
June 30 - July 31	3292	1443	2462	2117	9314 (47.9)
Aug. 1 - Sept. 3	1369	1525	1184	1832	5910 (30.4)
Sept. 4 - Oct. 15	1196	1003	1007	948	4224 (21.7)
Study Period	5857 (30.1)	3971 (20.4)	4723 (24.3)	4897 (25.2)	19448 (100.0)
AM + PM	9828 (50.5)		9620 (49.5)		
Mean daily effort[1]	129.3		300.6		

[1]The seasons included 76 weekdays and 32 weekend-days.

Table 4.15 Distribution of estimated angling effort (rod-hr) for all anglers by season, and area during the June 30 to October 15, 1984 bass open season on Sydenham Lake.
Values in parentheses are percentages of the grand total.

Season	Area			Total	Mean Daily Effort
	1	2	3		
June 30 - July 31	1473	4661	3180	9314 (47.9)	291.1
Aug. 1 - Sept. 3	2067	1959	1884	5910 (30.4)	173.8
Sept. 4 - Oct. 15	1208	2275	741	4224 (21.7)	100.6
Study Period	4748 (24.4)	8895 (45.7)	5805 (29.8)	19448 (100.0)	180.1

[1]The 1st season was 32 days long; 2nd season, 34 days; 3rd season, 42 days.

Table 4.16 Percentage of the total estimated effort (rod-hr) expended by anglers seeking a particular species, by area, during the June 30 to October 15, 1984 bass open season on Sydenham Lake.

Species	Area[1]			All Areas
	1	2	3	
Northern pike	33.3	31.8	33.3	32.6
Brown bullhead	3.3	2.1	2.4	2.5
Sunfish	0.0	0.4	0.0	0.2
Rock bass	3.4	2.5	4.1	3.2
Pumpkinseed	0.0	1.9	0.0	0.9
Bluegill	0.0	1.3	0.8	0.8
Smallmouth bass	53.1	50.7	60.6	54.3
Largemouth bass	64.9	73.1	83.5	74.2
Black crappie	4.1	0.0	0.6	1.2
Yellow perch	0.5	0.3	1.3	0.6
Walleye	0.0	0.0	1.2	0.4

[1]In some cases anglers sought more than one species, while others indicated no preference. As a result, columns may not add up to 100%.

Table 4.17 Percentage of the total estimated effort (rod-hr) expended by anglers seeking a particular species, by season, during the June 30 to October 15, 1984 bass open season on Sydenham Lake.

Species	Season[1]			All Seasons
	June 30-July 31	Aug. 1-Sept. 3	Sept. 4-Oct. 15	
Northern pike	17.8	35.3	61.6	32.6
Brown bullhead	1.8	3.7	2.2	2.5
Sunfish	0.4	0.0	0.0	0.2
Rock bass	1.8	6.9	1.2	3.2
Pumpkinseed	0.8	1.5	0.0	0.9
Bluegill	0.0	2.8	0.8	0.8
Smallmouth bass	51.1	61.2	51.6	54.3
Largemouth bass	72.6	65.1	90.5	74.2
Black crappie	0.0	3.9	0.0	1.2
Yellow perch	0.3	1.7	0.0	0.6
Walleye	0.0	1.2	0.0	0.4

[1]In some cases anglers sought more than one species, while others indicated no preference. As a result, columns may not add up to 100%.

Table 4.18 Observed CUE for northern pike anglers by season and area during the June 30 to October 15, 1984 bass open season on Sydenham Lake.

Season	Area			All Areas
	1	2	3	
June 30 - July 31	0.311	0.213	0.377	0.305
Aug. 1 - Sept. 3	0.393	0.134	0.345	0.252
Sept. 4 - Oct. 15	0.549	0.185	0.245	0.310
Study Period	0.466	0.172	0.305	0.291

Table 4.19 Observed CUE for smallmouth bass anglers by season and area during the June 30 to October 15, 1984 bass open season on Sydenham Lake.

Season	Area			All Areas
	1	2	3	
June 30 - July 31	0.317	0.381	0.184	0.288
Aug. 1 - Sept. 3	0.589	0.144	0.166	0.280
Sept. 4 - Oct. 15	0.038	0.057	0.062	0.055
Study Period	0.385	0.185	0.160	0.223

Table 4.20 Observed CUE for largemouth bass anglers by season and area during the June 30 to October 15, 1984 bass open season on Sydenham Lake.

Season	Area			All Areas
	1	2	3	
June 30 - July 31	0.621	0.467	0.428	0.477
Aug. 1 - Sept. 3	0.261	0.246	0.542	0.358
Sept. 4 - Oct. 15	0.102	0.273	0.496	0.270
Study Period	0.305	0.323	0.478	0.372

Table 4.21 Distribution of estimated northern pike catch for all anglers by season and area during the June 30 to October 15, 1984 bass open season on Sydenham Lake.
Values in parentheses are percentages of the grand total.

Season	Area			All Areas	Percent Harvested
	1	2	3		
June 30 - July 31	164	505	804	1473 (30.3)	18.1
Aug. 1 - Sept. 3	340	769	859	1968 (40.5)	30.7
Sept. 4 - Oct. 15	750	498	166	1414 (29.1)	22.5
Study Period	1254 (25.8)	1772 (36.5)	1829 (37.7)	4855 (100.0)	24.5

Table 4.22 Distribution of estimated smallmouth bass catch for all anglers by season and area during the June 30 to October 15, 1984 bass open season on Sydenham Lake.
Values in parentheses are percentages of the grand total.

Season	Area			All Areas	Percent Harvested
	1	2	3		
June 30 - July 31	265	1032	521	1818 (51.8)	27.3
Aug. 1 - Sept. 3	948	230	173	1351 (38.5)	29.4
Sept. 4 - Oct. 15	47	265	27	339 (9.7)	15.0
Study Period	1260 (35.9)	1527 (43.5)	721 (20.6)	3508 (100.0)	26.9

Table 4.23 Distribution of estimated largemouth bass catch for all anglers by season and area during the June 30 to October 15, 1984 bass open season on Sydenham Lake.
Values in parentheses are percentages of the grand total.

Season	Area			All Areas	Percent Harvested
	1	2	3		
June 30 - July 31	1111	1387	1049	3547 (53.4)	34.5
Aug. 1 - Sept. 3	418	548	1053	2019 (30.4)	35.2
Sept. 4 - Oct. 15	93	676	307	1076 (16.2)	33.7
Study Period	1622 (24.4)	2611 (39.4)	2409 (36.3)	6642 (100.0)	34.6

Table 4.24 The recommended maximum and estimated exploitation levels and yields for target species during the 1984 Sydenham Lake sport fishery.
Ryder's potential yield = 5.43 kg/ha/yr.
NG denotes no guidelines.

Species	Recommended Maximum Exploitation Level (%)	Estimated Exploitation Level (%)	Recommended Maximum Species Yield (kg/ha/yr)	Estimated Species Yield (kg/ha/yr)	RORY
Northern pike	25	30	1.36	1.61	1.19
Smallmouth bass	17-50	9	0.92-2.72	0.47	0.17-0.51
Largemouth bass	NG	NG	NG	2.04	NG
Yellow perch	13	1	0.71	0.04	0.06

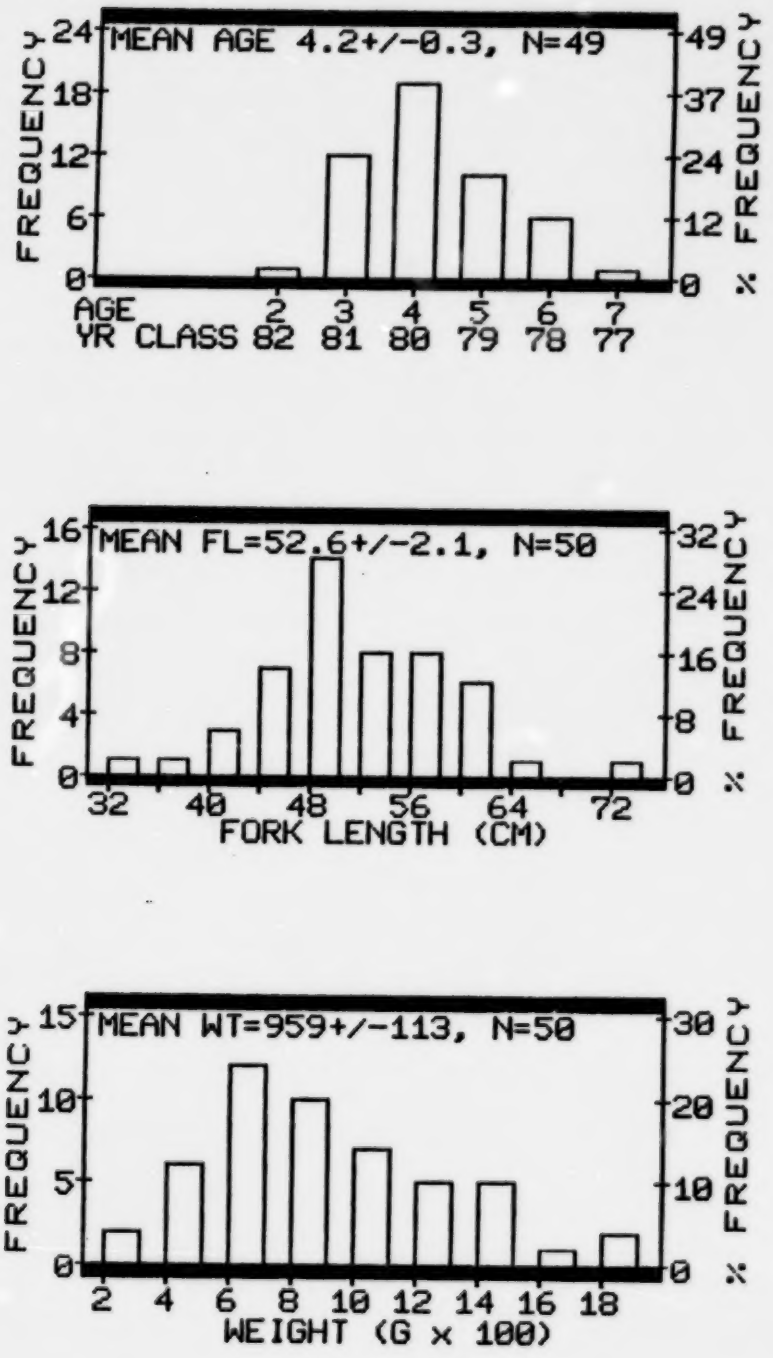


Figure 4.3 Age, length, and weight distributions for northern pike sampled during the 1984 summer sport fishery on Sydenham Lake.

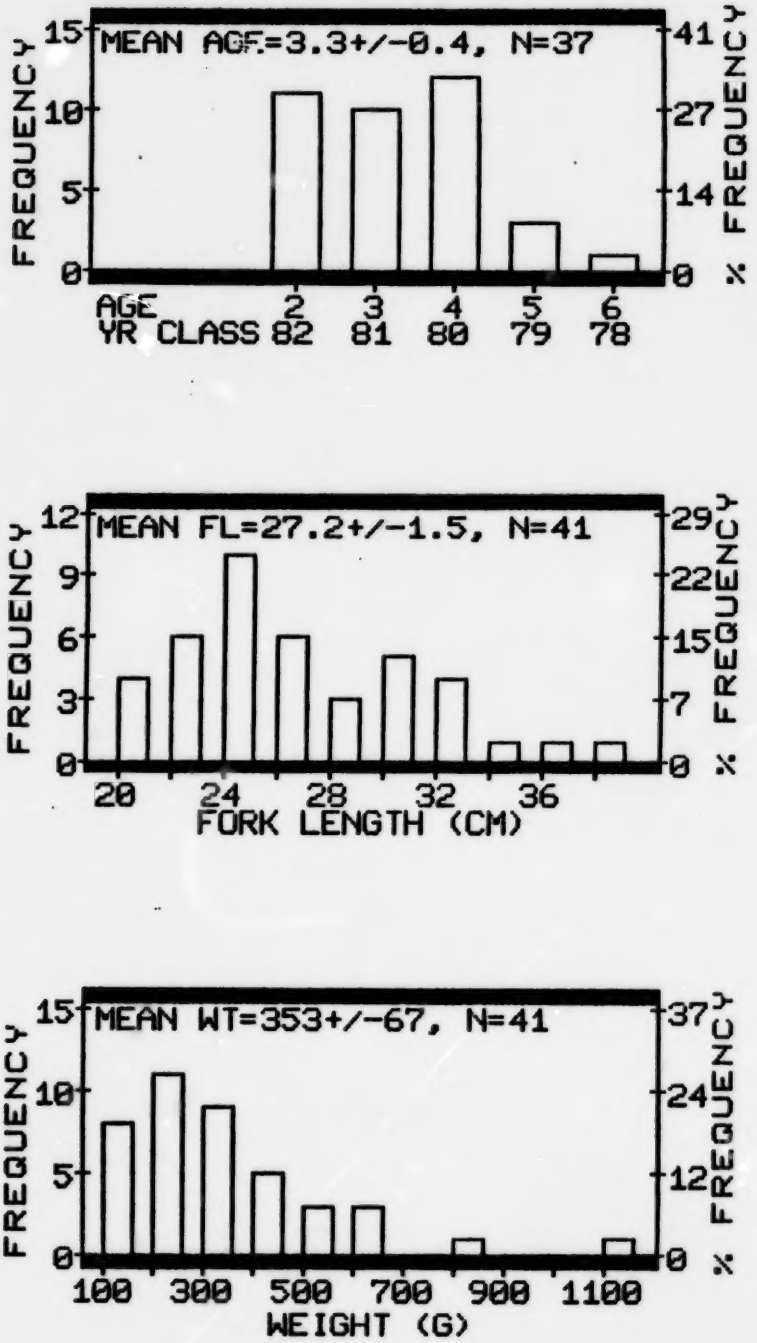
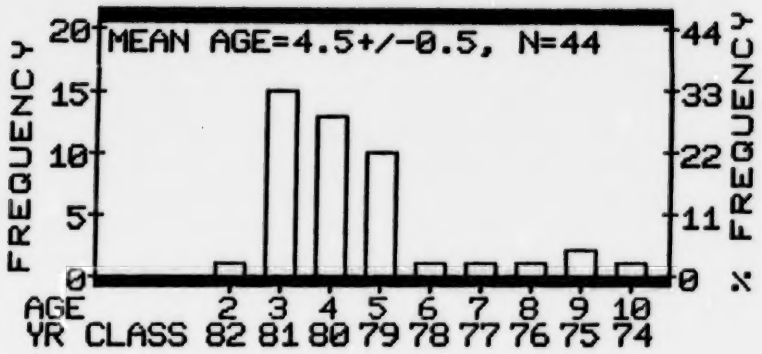
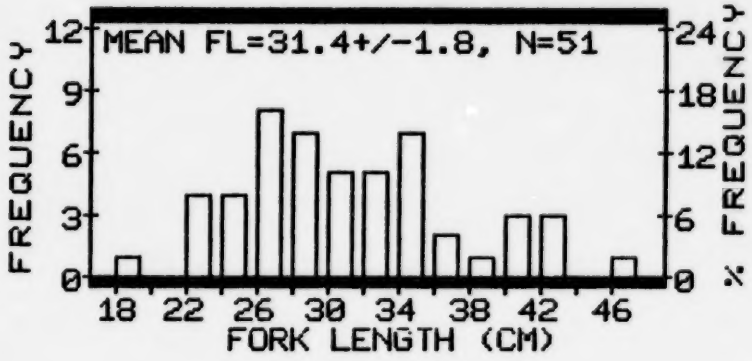


Figure 4.4 Age, length, and weight distributions for smallmouth bass sampled during the 1984 summer sport fishery on Sydenham Lake.





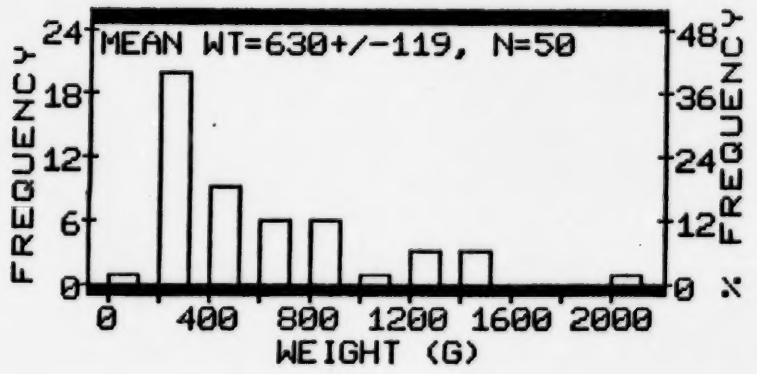


Figure 4.5 Age, length, and weight distributions for largemouth bass sampled during the 1984 summer sport fishery on Sydenham Lake.

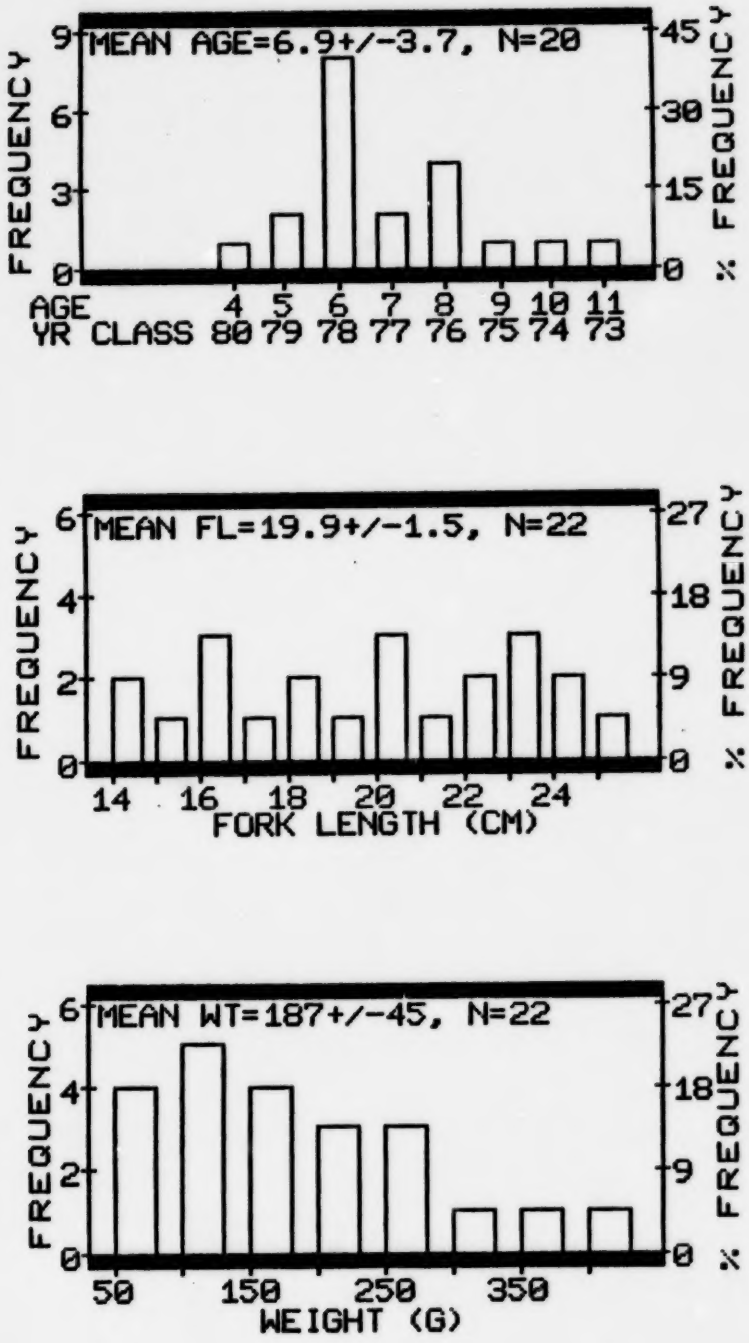


Figure 4.6 Age, length, and weight distributions for rock bass sampled during the 1984 summer sport fishery on Sydenham Lake.

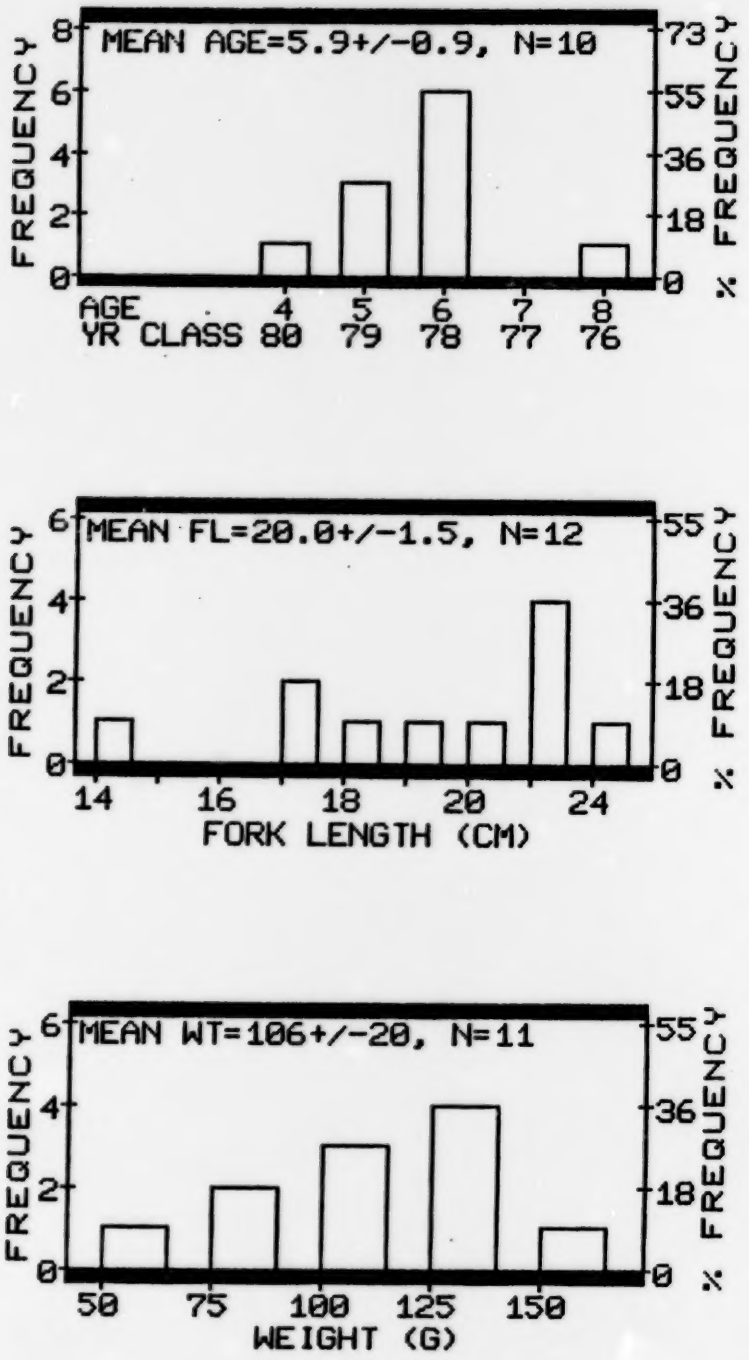


Figure 4.7 Age, length, and weight distributions for yellow perch sampled during the 1984 summer sport fishery on Sydenham Lake.

4.4 UPPER RIDEAU LAKE

4.4.1 Summer creel census. 1984

One thousand and fifty four anglers (497 parties) were interviewed on 42 sampling days.

Distribution of angling effort - An estimated 29,664 rod-hr (21.8 rod-hr/ha) were exerted during the 108-day survey (Table 4.25).

Seasonally, most angling effort was expended in June/July and the least in September/October. The mean daily effort was estimated to be over six times greater during June/July than during September/October. Spatially, Area 1 received the most effort, Area 2 the least (Tables 4.26 and 4.27).

Weekday anglers accounted for 58.7% of the total effort. However, average weekend-day effort was greater than the average weekday effort. On both weekend-days and weekdays the angling effort was greater during the afternoons than mornings (Table 4.26).

Smallmouth and largemouth bass were the most sought-after species in Upper Rideau Lake (all areas and seasons combined). Considerable angling effort was also directed towards yellow perch and northern pike. Yellow perch was the most sought after fish in Areas 1 and 2; smallmouth bass was particularily popular in Area 3. Angling pressure for largemouth bass declined as the seasons progressed (Tables 4.28 and 4.29).

Total catch and harvest - An estimated 59,067 fish comprising 10 species were caught, of which 16,592 were harvested. Rock bass were the most numerous fish caught, although only 5.7% were kept. Yellow perch dominated the harvest, followed by smallmouth and largemouth bass (Table 4.25).

The northern pike fishery - The observed CUE and HUE for species-specific anglers were 0.235 and 0.097 fish-rod/hr respectively (Table 4.25).

Seasonally, pike fishermen were most successful in September/October. Spatially, Area 2 had the highest CUE (Table 4.30).

Overall, an estimated 2,005 pike were caught, of which 587 were harvested (Table 4.25). The greatest number of pike were caught in June/July. Area 1 produced the greatest catch (Table 4.33).

The mean total length (+/- 95% confidence limits) of the 20 pike examined was 55.9 +/- 4.8 cm; mean fork length was 53.2 +/- 4.6 cm; and mean weight was 1121 +/- 256 g (Figure 4.8).

Northern pike entered the Upper Rideau Lake fishery (harvest) at age I and the oldest fish caught was age VI. The mean age of the harvested fish was 2.7 +/- 0.5 years (Figure 4.8).

The estimated yield of northern pike for the 1984 summer fishery was 0.48 +/- 0.17 kg/ha.

The smallmouth bass fishery - The observed CUE and HUE for species-specific anglers were 0.183 and 0.050 fish rod/hr respectively (Table 4.25).

Seasonally, smallmouth bass anglers were most successful in July/August. Spatially, Area 2 had the highest CUE (Table 4.31).

Overall, an estimated 7,011 smallmouth bass were caught of which 2,463 were harvested (Table 4.25). The greatest number of smallmouth bass were caught in June/July. Area 3 produced the greatest catch (Table 4.34).

The mean total length of the 50 smallmouth bass sampled was 36.3 +/- 1.6 cm; mean fork length was 34.6 +/- 1.5 cm; and mean weight was 747 +/- 110 g. (Figure 4.9).

Smallmouth bass entered the Upper Rideau Lake fishery at age III and the oldest fish caught was age IX. The mean age of the harvested fish was 4.7 +/- 0.4 years (Figure 4.9).

The estimated smallmouth bass yield for the 1984 summer sport fishery was 1.35 +/- 0.92 kg/ha.

The largemouth bass fishery - The observed CUE and HUE for species-specific anglers were 0.168 and 0.060 respectively (Table 4.25).

Seasonally, largemouth bass anglers were most successful in September/October. Spatially, Area 1 had the highest CUE (Table 4.32).

Overall, an estimated 4,878 fish were caught of which 1,769 were harvested (Table 4.25). The greatest number of largemouth bass were caught in June/July. Area 1 provided the best fishing (Table 4.35).

The mean total length of the 50 largemouth bass sampled was 34.4 +/- 1.1 cm; mean fork length was 33.2 +/- 1.1 cm; and mean weight 653 +/- 80 g (Figure 4.10).

Largemouth bass entered the Upper Rideau Lake fishery at age III and the oldest fish caught was age IX. The mean age of the harvested fish was 5.2 +/- 0.4 years (Figure 4.10).

The estimated largemouth bass yield for the 1984 summer sport fishery was 0.85 +/- 0.28 kg/ha.

Other fisheries - The estimated harvest of other 'non-sport' fish species included 9090 yellow perch, 885 pumpkinseeds, 849 bluegill, and 707 rock bass (Table 4.25).

The mean fork length of the 50 yellow perch sampled was 22.0 +/- 0.6 cm; mean weight was 148 +/- 13 g; and mean age 5.1 +/- 0.3 years (Figure 4.11).

The estimated yield of yellow perch for the 1984 summer fishery was 0.99 +/- 0.26 kg/ha.

Fishing methods, user-group information - The mean number of rods/angling party was 2.12. Fourty seven percent of the anglers interviewed fished by spin-casting, 26% still fished, 17% drifted, 5% trolled, and 5% used a combination of the above. Jigging and fly fishing were observed in less than 1% of the parties. One percent of the anglers interviewed were guided; the other 99% were unguided.

Seventy-one percent of the anglers interviewed were resident of the United States, 15% were non-local Ontario residents, and 3% of the anglers were local residents. Out-of-province Canadian residents and residents of countries other than Canada or the U.S. made up less than 1% of the anglers interviewed.

The breakdown of visitor-types was: 3% permanent residents; 15% non-permanent residents; 1% daytrippers; <1% campers (provincial); 22% campers (commercial); <1% campers (crown); 51% other (paid); and 8% other (non-paid).

4.4.2 Biological characteristics of the harvest

The total estimated yield of the major species for the Upper Rideau Lake summer fishery was 3.67 kg/ha or 72% of the annual potential yield predicted from the MEI (5.07 kg/ha) (Table 4.36). The ratio of observed to recommended yield for yellow perch is approximately 1.5. Northern pike yield falls within the recommended level. The RORY index for smallmouth bass yield varies between 0.5 and 1.6 because of the range in the recommended yield values.

The mean age at harvest for northern pike was 2.7 years; slightly less than the age at maturity cited by Scott and Crossman (1973), ie. 2-3 years for males, 3-4 for females. The mean age at harvest for smallmouth bass, largemouth bass, and yellow perch all exceed age at maturity.

Total mortality rates for the major sport species are: northern pike, 0.41 (ages 2-6); smallmouth bass, 0.45 (ages 4-9); largemouth bass, 0.46 (ages 5-9); and yellow perch, 0.45 (ages 5-9).

Table 4.25 Summary of catch, harvest and effort data from the creel census conducted on Upper Rideau Lake during the June 30 - October 15, 1984 open season. Values in parentheses are standard errors.

ALL ANGLERS

Species	# Anglers[1]	OBSERVED Catch (#)	OBSERVED Harvest (#)	OBSERVED Effort (rod-hr)	OBSERVED CUE (#/rod-hr)	OBSERVED HUE (#/rod-hr)	ESTIMATED Catch (#)	ESTIMATED Harvest (#)	ESTIMATED Effort (rod-hr)	ESTIMATED CUE (#/rod-hr)	ESTIMATED HUE (#/rod-hr)
Northern pike	1054	111	38	1610	0.068	0.024	2005 (384)	587 (104)	29664 (1606)	0.067	0.020
Brown bullhead	1054	4	4	1610	0.002	0.002	84 (40)	84 (40)	29664 (1606)	0.002	0.002
Sunfish	1054	231	1	1610	0.143	0.001	3853 (1020)	18 (15)	29664 (1606)	0.129	0.001
Rock bass	1054	723	42	1610	0.449	0.026	12411 (1652)	707 (170)	29664 (1606)	0.418	0.024
Pumpkinseed	1054	606	48	1610	0.376	0.030	11473 (1541)	885 (459)	29664 (1606)	0.386	0.030
Bluegill	1054	341	46	1610	0.211	0.029	6904 (1710)	849 (280)	29664 (1606)	0.232	0.029
Smallmouth bass	1054	295	80	1610	0.183	0.050	7011 (1285)	2463 (838)	29664 (1606)	0.236	0.083
Largemouth bass	1054	271	96	1610	0.168	0.060	4878 (646)	1769 (294)	29664 (1606)	0.164	0.060
Black crappie	1054	21	5	1610	0.013	0.003	311 (132)	140 (75)	29664 (1606)	0.010	0.005
Yellow perch	1054	561	484	1610	0.348	0.310	10137 (1265)	9090 (1171)	29664 (1606)	0.342	0.306
Walleye	1054	0	0	1610	0.000	0.000	0 (0)	0 (0)	29664 (1606)	0.000	0.000

SPECIES SPECIFIC ANGLERS

Species	# Anglers[1]	OBSERVED Catch (#)	OBSERVED Harvest (#)	OBSERVED Effort (rod-hr)	OBSERVED CUE (#/rod-hr)	OBSERVED HUE (#/rod-hr)	ESTIMATED Catch (#)	ESTIMATED Harvest (#)	ESTIMATED Effort (rod-hr)	ESTIMATED CUE (#/rod-hr)	ESTIMATED HUE (#/rod-hr)
Northern pike	207	92	38	391	0.235	0.097	1438 (283)	582 (111)	5273 (630)	0.272	0.110
Sunfish	3	6	0	4	1.570	0.000	424 (370)	0 (0)	97 (51)	4.335	0.000
Rock bass	35	53	31	67	0.787	0.463	1029 (189)	575 (189)	1082 (263)	0.951	0.531
Pumpkinseed	17	51	44	42	1.201	1.048	606 (250)	470 (224)	464 (192)	1.306	1.013
Bluegill	18	100	34	48	2.063	0.708	1896 (1027)	385 (141)	600 (212)	3.158	0.642
Smallmouth bass	437	274	80	681	0.402	0.117	6669 (1235)	2472 (836)	12258 (1089)	0.544	0.202
Largemouth bass	404	266	96	731	0.363	0.131	4226 (525)	1572 (280)	11068 (1136)	0.381	0.142
Black crappie	4	2	2	8	0.250	0.250	40 (26)	40 (26)	134 (82)	0.304	0.299
Yellow perch	357	497	472	603	0.824	0.783	9002 (1180)	8504 (1114)	10253 (993)	0.878	0.829
Walleye	50	0	0	90	0.000	0.000	0 (0)	0 (0)	1611 (358)	0.000	0.000

[1]478 parties were interviewed.

Table 4.26 Distribution of estimated angling effort (rod-hr) for all anglers by season, day-type, and time period during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.
Values in parentheses are percentages of the grand total.

Season	Weekday		Weekend-day		Total
	AM	PM	AM	PM	
June 30 - July 31	4744	3606	2824	3720	14894 (50.2)
Aug. 1 - Sept. 3	2661	4482	1448	3100	11691 (39.4)
Sept. 4 - Oct. 15	665	1265	523	626	3079 (10.4)
Study Period	8070 (27.2)	9353 (31.5)	4795 (16.2)	7446 (25.1)	29664 (100.0)
AM + PM	17423 (58.7)		12241 (41.3)		
Mean daily effort[1]	229.3		382.5		

[1]The study period included 76 weekdays and 32 weekend-days.

Table 4.27 Distribution of estimated angling effort (rod-hr) for all anglers by season, and area during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.
Values in parentheses are percentages of the grand total.

Season	Area			Total	Mean Daily Effort[1]
	1	2	3		
June 30 - July 31	6887	3188	4819	14984 (50.2)	465.4
Aug. 1 - Sept. 3	6544	1930	3217	11691 (39.4)	343.9
Sept. 4 - Oct. 15	2192	251	636	3079 (10.4)	73.3
Study Period	15623 (52.7)	5369 (18.1)	8672 (29.2)	29664 (100.0)	274.7

[1]The 1st season was 32 days long; 2nd season, 34 days; 3rd season, 42 days.

Table 4.28 Percentage of the total estimated effort (rod-hr) expended by anglers seeking a particular species, by area, during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.

Species	Area[1]			All Areas
	1	2	3	
Northern pike	19.1	25.3	10.7	17.8
Sunfish	0.2	0.0	0.8	0.3
Rock bass	3.3	3.3	4.5	3.6
Pumpkinseed	2.7	0.8	0.0	1.6
Bluegill	1.3	1.0	3.9	2.0
Smallmouth bass	33.3	26.7	64.9	41.3
Largemouth bass	37.7	43.0	33.2	37.3
Black crappie	0.9	0.0	0.0	0.5
Yellow perch	43.3	46.1	11.1	34.4
Walleye	5.7	1.5	7.3	5.4

[1]In some cases anglers sought more than one species, while others indicated no preference. As a result, columns may not add up to 100%.

Table 4.29 Percentage of the total estimated effort (rod-hr) expended by anglers seeking a particular species, by season, during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.

Species	Season[1]			All Seasons
	June 30-July 31	Aug. 1-Sept. 3	Sept. 4-Oct. 15	
Northern pike	17.3	17.8	19.8	17.8
Sunfish	0.7	0.0	0.0	0.3
Rock bass	4.6	0.3	0.0	3.6
Pumpkinseed	0.8	2.0	3.4	1.6
Bluegill	3.5	0.5	0.7	2.0
Smallmouth bass	37.3	46.9	39.2	41.3
Largemouth bass	45.1	35.8	22.9	37.3
Black crappie	0.5	0.5	0.0	0.5
Yellow perch	37.4	28.6	43.7	34.4
Walleye	4.9	6.1	5.0	5.4

[1]In some cases anglers sought more than one species, while others indicated no preference. As a result, columns may not add up to 100%.

Table 4.30 Observed CUE for northern pike anglers by season and area during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.

Season	Area			All Areas
	1	2	3	
June 30 - July 31	0.218	0.278	0.095	0.196
Aug. 1 - Sept. 3	0.215	0.320	0.000	0.255
Sept. 4 - Oct. 15	0.364	0.293	0.317	0.343
Study Period	0.237	0.299	0.123	0.235

Table 4.31 Observed CUE for smallmouth bass anglers by season and area during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.

Season	Area			All Areas
	1	2	3	
June 30 - July 31	0.232	0.719	0.386	0.352
Aug. 1 - Sept. 3	0.357	0.895	0.415	0.470
Sept. 4 - Oct. 15	0.049	0.429	1.444	0.334
Study Period	0.272	0.792	0.438	0.402

Table 4.32 Observed CUE for largemouth bass anglers by season and area during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.

Season	Area			All Areas
	1	2	3	
June 30 - July 31	0.365	0.133	0.226	0.278
Aug. 1 - Sept. 3	0.558	0.333	0.478	0.472
Sept. 4 - Oct. 15	0.708	0.000	0.000	0.571
Study Period	0.465	0.222	0.281	0.363

Table 4.33 Distribution of estimated northern pike catch for all anglers by season and area during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.
Values in parentheses are percentages of the grand total.

Season	Area			All Areas	Percent Harvested
	1	2	3		
June 30 - July 31	483	141	100	724 (36.1)	41.1
Aug. 1 - Sept. 3	339	311	43	693 (34.6)	29.1
Sept. 4 - Oct. 15	253	26	307	586 (29.3)	14.7
Study Period	1075 (53.7)	478 (23.9)	450 (22.5)	2003 (100.0)	29.3

Table 4.34 Distribution of estimated smallmouth bass catch for all anglers by season and area during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.
Values in parentheses are percentages of the grand total.

Season	Area			All Areas	Percent Harvested
	1	2	3		
June 30 - July 31	745	1277	1325	3347 (47.8)	38.2
Aug. 1 - Sept. 3	1338	665	678	2681 (38.3)	31.8
Sept. 4 - Oct. 15	22	77	880	979 (14.0)	33.6
Study Period	2105 (30.0)	2019 (28.8)	2883 (41.1)	7007 (100.0)	35.1

Table 4.35 Distribution of estimated largemouth bass catch for all anglers by season and area during the June 30 to October 15, 1984 bass open season on Upper Rideau Lake.
Values in parentheses are percentages of the grand total.

Season	Area			All Areas	Percent Harvested
	1	2	3		
June 30 - July 31	1406	303	679	2388 (49.0)	34.2
Aug. 1 - Sept. 3	1239	593	395	2227 (45.7)	37.7
Sept. 4 - Oct. 15	260	0	0	260 (5.3)	41.9
Study Period	2905 (59.6)	896 (18.4)	1074 (22.0)	4875 (100.0)	36.3

Table 4.36 The recommended maximum and estimated exploitation levels and yields for target species during the 1984 Upper Rideau Lake sport fishery.
Ryder's potential yield = 5.07 kg/ha/yr.
NG denotes no guidelines.

Species	Recommended Maximum Exploitation Level (%)	Estimated Exploitation Level (%)	Recommended Maximum Species Yield (kg/ha/yr)	Estimated Species Yield (kg/ha/yr)	RORY
Northern pike	25	10	1.27	0.48	0.38
Smallmouth bass	17-50	27	0.86-2.54	1.35	0.53-1.57
Largemouth bass	NG	NG	NG	0.85	NG
Yellow perch	13	20	0.66	0.99	1.50
Walleye	32	0	1.62	0	0

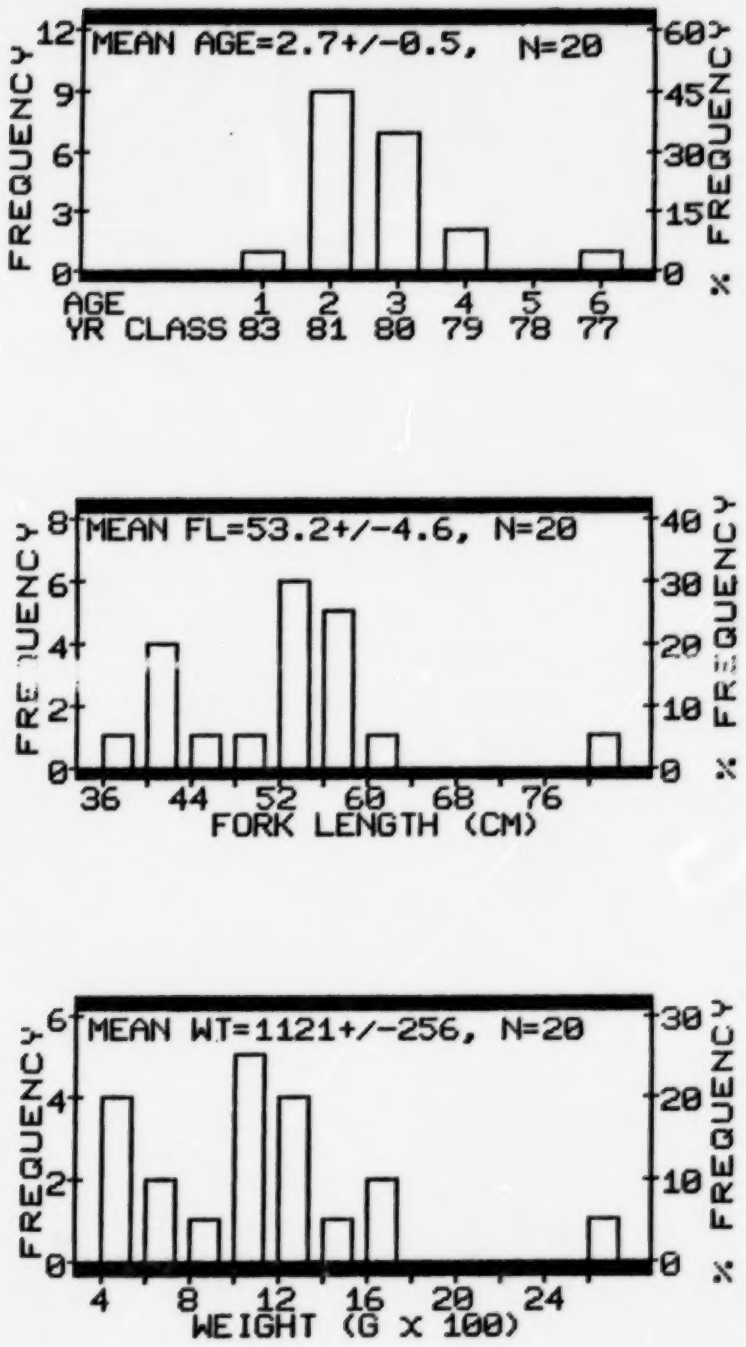


Figure 4.8 Age, length, and weight distributions for northern pike sampled during the 1984 summer sport fishery on Upper Rideau Lake.

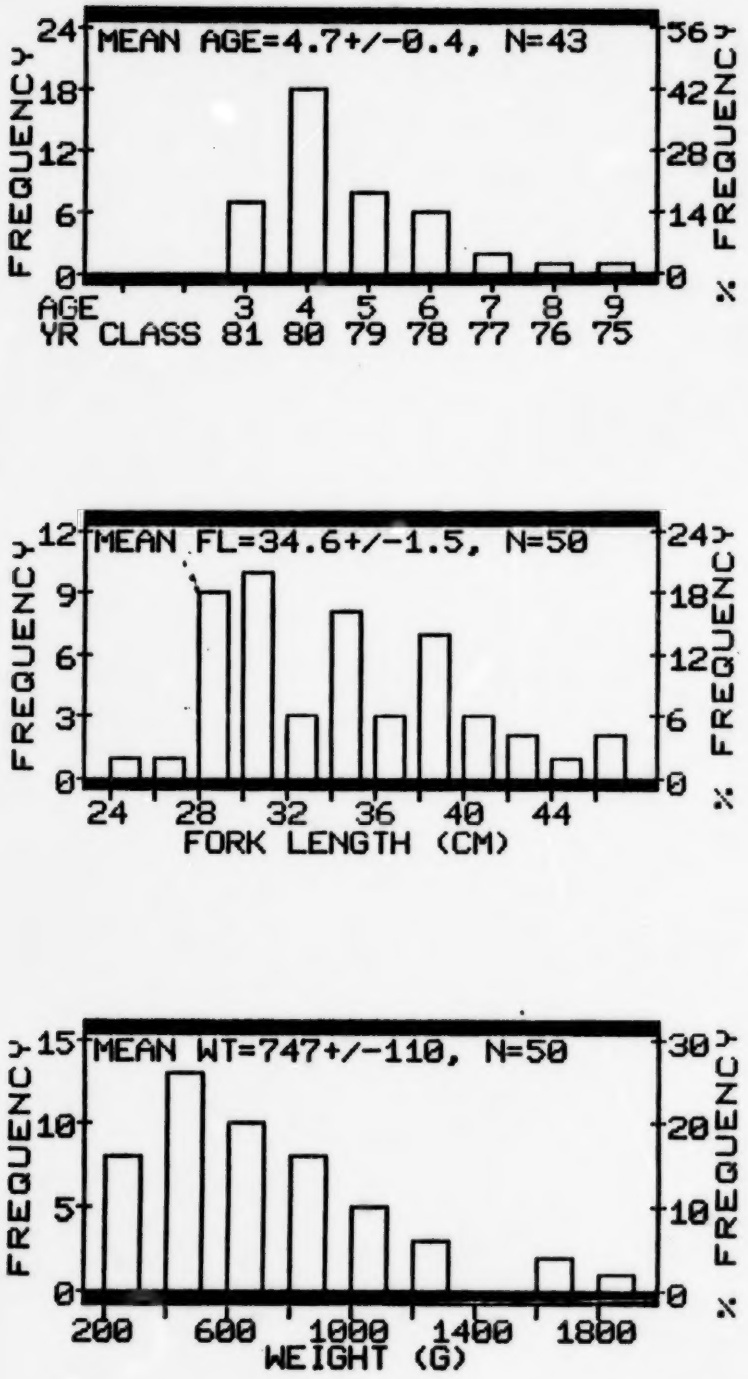


Figure 4.9 Age, length, and weight distributions for smallmouth bass sampled during the 1984 summer sport fishery on Upper Rideau Lake.

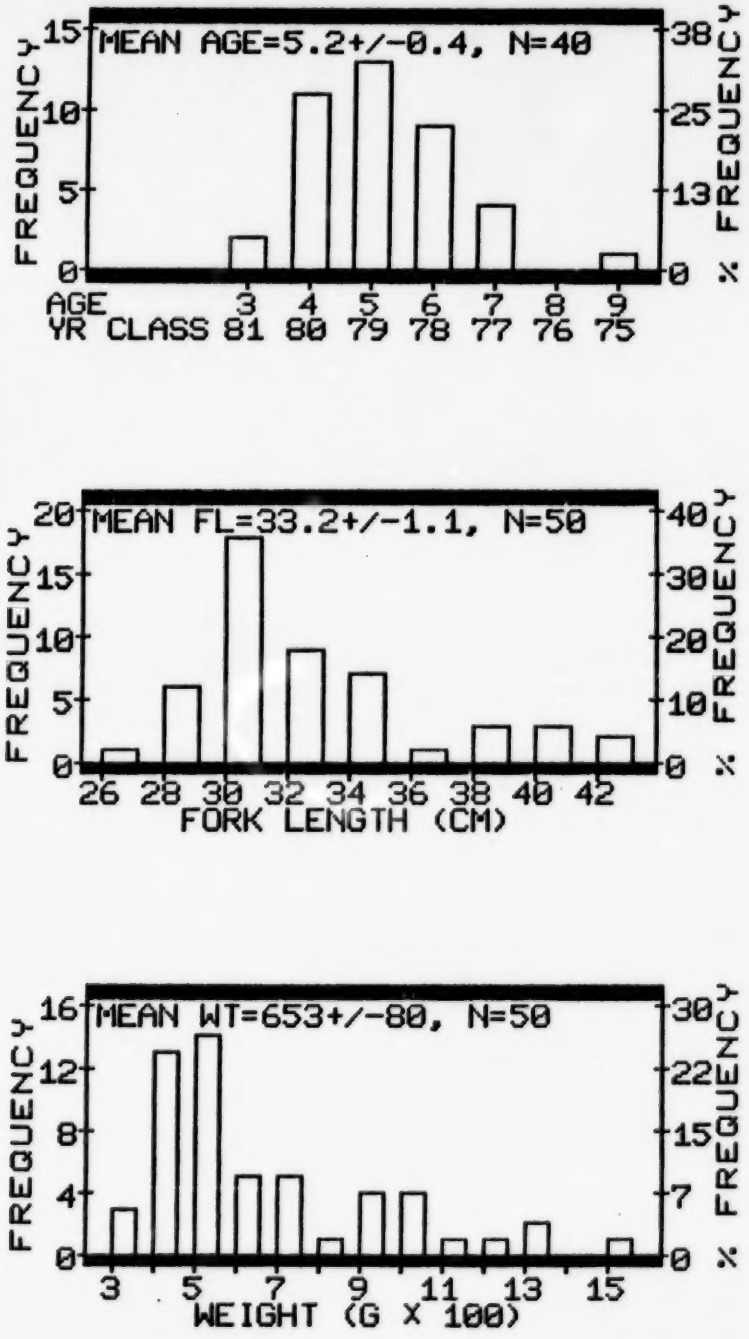


Figure 4.10 Age, length, and weight distributions for largemouth bass sampled during the 1984 summer sport fishery on Upper Rideau Lake.

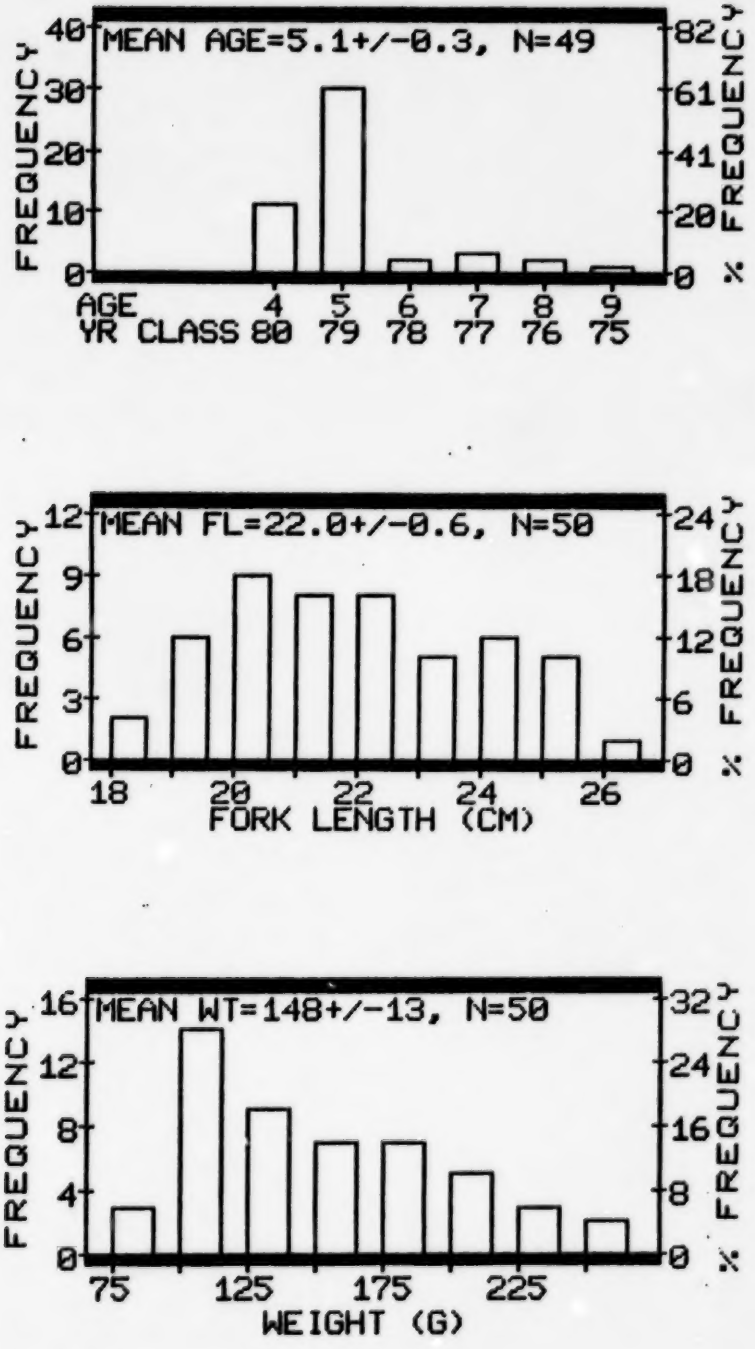


Figure 4.11 Age, length, and weight distributions for yellow perch sampled during the the 1984 summer sport fishery on Upper Rideau Lake.

5. MANAGEMENT IMPLICATIONS

5.1 LEVEL OF EXPLOITATION

5.1.1 Indices of overexploitation

Overexploitation is prominent among the reasons cited for the erosion of fishery resources and the loss of recreation and business opportunites in Ontario (Loftus 1976). Members of the SPOF Working Group #15 (MNR 1983) offered the following definition for overexploitation:

> A fishery resource is being overexploited if, because of fishing, yields no longer can be maintained at or near peak potential, or there is good reason to believe that the resource is predisposed to collapse or displacement.

It has been proposed that the level of stress from exploitation can be ascertained from the changes in the relationships between angler effort and fish yield and abundance (MNR 1983) (Table 5.1). There is no single biological measurement, short of collapse of the population that stands alone as an adequate index of overexploitation. Members of the SPOF Working Group #15 (MNR 1983) described several indices which, taken together, can provide a reasonable picture of the level of exploitation in a fishery, ie. relative yield indices, total mortality, Abrosov Index, length-at-age, and trend analysis. Some of these indices are described below.

Relative Yield Indices (RYI and RORY) - MNR (1982) stressed that the exploitation levels they developed were of an interim nature and discussed several factors which may affect their present interpretation. These include: stocking, energy input and utilization, habitat destruction, method of harvesting, alterations in community structure and lake size.

The inherent confidence limits associated with observed and potential yield calculations make interpretation difficult. A rule of thumb stated in the report of SPOF working group number twelve (MNR 1982) is that the true value of the potential yield may be from 0.33 to 3 times the estimated value. Confidence limits for observed yield calculated in this report suggest that the true values are between 0.5 and 1.5 times the estimated value.

Nonetheless, MNR (1983) recommends that for a margin of safety in managing a multispecies fishery, the total yield of all species should be less than 100% of the potential yield, ie. the sum of estimated exploitation levels is less than 100% or the RYI is less than one. It is important to note however, that although a RYI or RORY value of greater than one is suggestive of overexploitation, a value less than one is not necessarily "safe". A value less than one could indicate that a fishery is on the verge of collapse as a result of prior overexploitation.

Total mortality- Tentatively, a total mortality rate greater than 50% for smallmouth bass and 65% for northern pike may be indicative of overexploitation (MNR 1983). We have calculated total mortality rates using catch curves (Ricker 1975). However five years data has shown that these mortality estimates are usually very imprecise due to small sample size and few age classes.

Mean Age of Catch- The mean age of the catch is often compared to the age of sexual maturity. If mature fish are overexploited it has been suggested that reproduction of the population may fail (MNR 1983).

Trend analysis- The trend-through-time of these indices, as well as trends of fishery statistics such as CUE, catch and effort will prove invaluable for assessing changes in the level of exploitation.

5.1.2 Assessment of individual lakes

In the following assessments, we have assumed that a general sequence of events takes place when a fish population is exploited (Table 5.1). In the "very early stage" of development effort initially expands, yield increases, while total mortality rate, growth rate, and mean age remain relatively constant. As effort expands further and the population enters the "early stage" of development yield will continue to increase. In the intermediate stages of development,effort and yield will continue to increase while CUE and mean age decrease, and total mortality rate and growth rate increase. In the "heavily stressed" stage effort and yield remain high however CUE becomes highly variable. In the "recently overstressed" stage fishing effort remains high while yield starts to decline. Finally, in the "late stage of overexploitation", yield, CUE and mean age have all decreased substantially, while total mortality rate and growth remain high.

The indices of overexploitation alone do not lead to a clear cut interpretation for any of the study lakes. Trend-through time analysis will provide a more conclusive picture.

Mica Lake- The exploitation of the fish populations in this lake is very low. Trapnetting results indicate that there is a healthy northern pike population present (total mortality= 0.29 (ages 5-7); growth index=93%; mean age=4.8 years) (Mathers et al. 1986).

Opinicon Lake- Fishing pressure on Lake Opinicon, expressed as total estimated effort, decreased by 18% compared to 1982. Species specific effort directed towards northern pike and smallmouth bass declined, while that for largemouth bass showed little change.

Largemouth bass continue as the dominant sport species in

terms of angler preference, catch and harvest. Although 1984 largemouth bass harvest was almost the same as 1982, yield increased with the mean weight of harvested fish. Mortality is low, as a wide range of age classes are represented. The mean age of the harvest is far above age-at-maturity. Although there are no recommended maximum species yields for largemouth bass alone, the combined yield of smallmouth and largemouth bass exceeds the maximum yield recommended for smallmouth bass alone.

The yield of northern pike declined in 1984, along with catch, harvest, mean age, and mean weight. These changes may be in response to prior overexploitation (1982 RORY=1.02; 1982 total mortality=0.76 (Mathers et al. 1986)). Yield indices, total mortality, and mean age for the 1984 summer fishery are within recommended levels (MNR 1982) (Tables 5.2-5.5).

Sydenham Lake- Overall fishing pressure in 1984 was almost identical to that for 1982. However, considerably more species-specific effort was directed to smallmouth bass.

The northern pike fishery is showing signs of possible overexploitation: yield continues to exceed recommended values; mortality is high; and mean age is declining. However, an increase in total catch, and CUE, together with a lower mean age could indicate recruitment of a strong year class.

Smallmouth bass also indicate possible overexploitation: CUE and HUE; yield; and mean age are declining; while mortality is higher than recommended values.

Largemouth bass continue to be the dominant sport species in terms of angler preference and harvest. An increase in CUE, catch, and harvest and a decrease in mean age may indicate a strong year class entering the fishery (Tables 5.2-5.5).

Upper Rideau Lake- Overall fishing pressure in 1984, decreased by 18% in comparison to 1982. Although largemouth bass, smallmouth bass, and yellow perch remained the most sought after species, less effort was directed towards yellow perch and more towards smallmouth and largemouth bass.

Northern pike harvest, HUE, mean age, fork length, and weight all decreased; probably in response to overexploitation (1982 mortality=0.75; 1982 RORY=1.27). Yield indices now fall within recommended levels (MNR 1983). Good recruitment of younger age groups is apparently maintaining CUE levels as II and III year olds dominate the harvest.

CUE, HUE, catch, harvest, and yield all increased substantially for both smallmouth and largemouth bass. Mortality rates for both species are high (approaching 0.50); and growth rates and mean age are good. The 1984 smallmouth bass yield exceeds the lower limit of of the recommended allowable yield MNR 1982).

Yellow perch yield declined in 1984, but is still above recommended levels. Catch, harvest, CUE, and HUE, also decreased dramatically. This decline of yellow perch is probably in response to previous overharvest, in conjunction with an increase in the bass populations (Tables 5.2-5.5).

Table 5.1 Relationship between yield, fishing effort and fish abundance during stages in the development of a fishery.

Yield	Fishing Effort	Abundance	Stage of Development
low	low	high	very early stage
intermediate	low	high	early stage
intermediate	intermediate	intermediate	early intermediate
high	high	intermediate	late intermediate
high	high	highly variable	heavily stressed
intermediate	high	low	recently overstressed
low	low	low	late stage of overexploitation

Table 5.2 Yield indices for the summer sport fisheries on Opinicon, Sydenham, and Upper Rideau Lakes. N/A denotes not applicable.

			RORY[2]				
Lake	Year	RYI[1]	Northern Pike	Smallmouth Bass[3]	Smallmouth and Largemouth Bass	Yellow Perch	Walleye
Opinicon	1982	0.81	1.02	0.06 - 0.18	0.84 - 2.50	0.00	N/A
	1984	0.61	0.46	0.03 - 0.08	0.99 - 2.93	0.02	N/A
Sydenham	1982	0.98	1.03	0.25 - 0.72	0.74 - 2.20	0.25*	N/A
	1984	0.76	1.19	0.17 - 0.51	0.92 - 2.73	0.06	N/A
Upper Rideau	1982	0.88	1.27	0.10 - 0.28	0.31 - 0.90	3.15	0.01
	1984	0.72	0.38	0.53 - 1.57	0.87 - 2.56	1.50	0.00

[1]RYI = total estimated yield of all species/potential yield.

[2]RORY = estimated species yield/recommended species yield.

[3]MNR (1982) lists a range for the allowable yield of smallmouth bass.

*estimated from mean weight in index trapnets.

Table 5.3 Trends in total estimated effort, catch, harvest, and yield for Opinicon, Sydenham, and Upper Rideau Lakes. Effort is expressed in rod-hours; catch and harvest in numbers; and yield in kg/ha. 'ne' denotes not estimated

			Northern Pike			Smallmouth Bass			Largemouth Bass			Yellow Perch		
Lake	Year	Total Effort	Catch	Harvest	Yield	Catch	Harvest	Yield	Catch	Harvest	Yield	Catch	Harvest	Yield
Opinicon	1982	30201	3694	1091	1.99	871	344	0.24	9899	3515	3.06	31	0	0.0
	1984	24660	2483	681	0.90	748	123	0.11	6931	3380	3.76	120	51	ne
Sydenham	1982	19486	2293	970	1.40	1291	534	0.67	2688	1401	1.24	1488	901	0.18*
	1984	19448	4860	1191	1.61	3512	945	0.47	6646	2298	2.04	1622	284	0.04
Upper Rideau	1982	36490	1784	1453	1.61	2297	347	0.24	2688	915	0.53	35322	20977	2.08*
	1984	29664	2005	587	0.48	7011	2463	1.35	4878	1769	0.85	10137	9090	0.99

*estimated from mean weight in index trapnets.

Table 5.4 Observed CUE and HUE for species specific anglers on Opinicon, Sydenham, and Upper Rideau Lakes during the summer fisheries of 1982 and 1984.

		Northern Pike		Smallmouth Bass		Largemouth Bass		Yellow Perch	
Lake	Year	CUE	HUE	CUE	HUE	CUE	HUE	CUE	HUE
Opinicon	1982	0.261	0.115	0.177	0.068	0.322	0.133	0.062	0.000
	1984	0.227	0.117	0.215	0.071	0.271	0.120	-	-
Sydenham	1982	0.195	0.106	0.243	0.118	0.141	0.093	0.506	0.307
	1984	0.291	0.099	0.223	0.066	0.372	0.139	0.541	0.111
Upper Rideau	1982	0.209	0.192	0.229	0.035	0.230	0.059	2.142	1.340
	1984	0.235	0.097	0.402	0.117	0.363	0.131	0.824	0.783

Table 5.5 Characteristics of the fish harvested during the 1982 and 1984 summer creel surveys on Opinicon, Sydenham, and Upper Rideau Lakes.

Lake	Species	Year	n	Mean Fork Length (cm)	Mean Total Length (cm)	Mean Weight (g)	Mean Age (yrs)
Opinicon	Northern pike	1982	6	63.9	60.2	1432	5.5
		1984	16	58.0	54.9	1039	4.3
	Smallmouth bass	1982	6	34.6	32.6	551	6.3
		1984	2	35.0	33.7	681	5.0
	Largemouth bass	1982	66	35.5	34.0	688	7.6
		1984	49	37.6	36.9	876	8.1
Sydenham	Northern pike	1982	25	56.9	53.9	1024	5.1
		1984	50	55.3	52.6	959	4.2
	Smallmouth bass	1982	11	37.2	35.1	892	7.5
		1984	41	28.8	27.2	353	3.3
	Largemouth bass	1982	29	34.4	32.3	680	7.2
		1984	51	32.9	31.4	630	4.5
Upper Rideau	Northern pike	1982	15	63.5	60.4	1506	5.4
		1984	20	55.9	53.6	1121	2.7
	Smallmouth bass	1982	7	38.0	36.5	945	7.7
		1984	50	36.3	34.6	747	4.7
	Largemouth bass	1982	18	35.6	34.3	783	7.0
		1984	50	34.4	33.2	653	5.2

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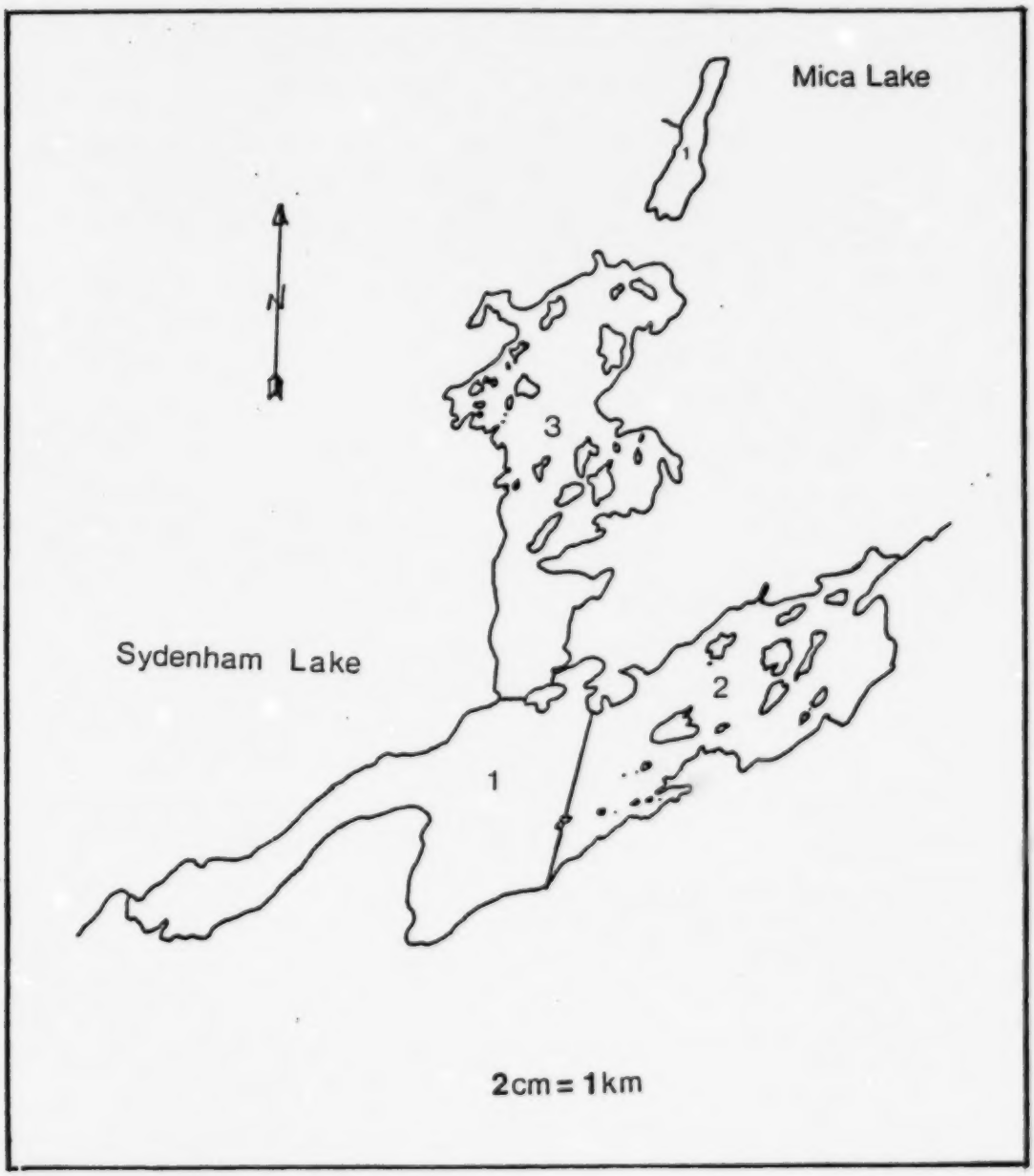
8. APPENDICES

8.1 Creel census areas on:

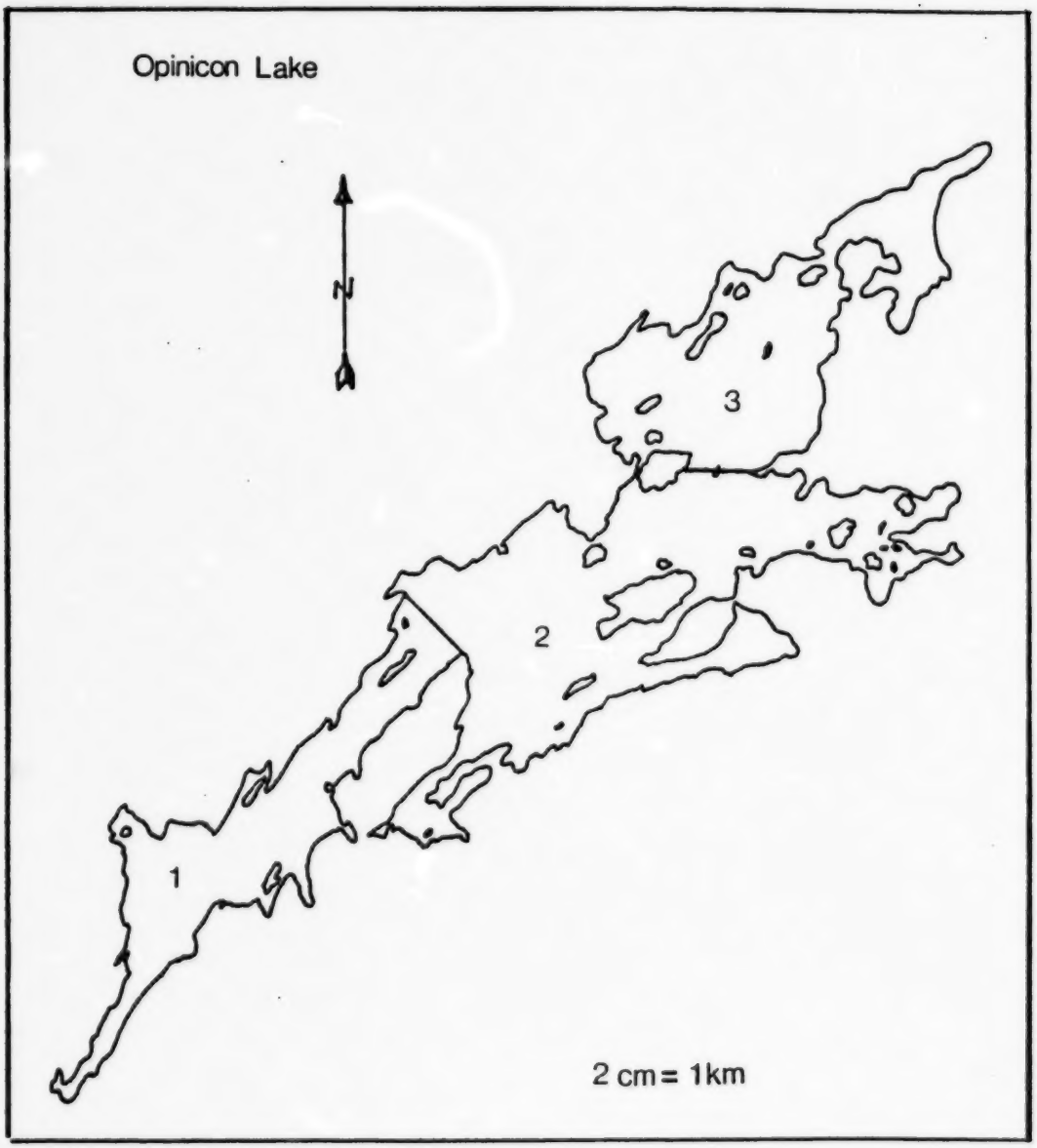
a) Mica and Sydenham Lakes

b) Opinicon Lake

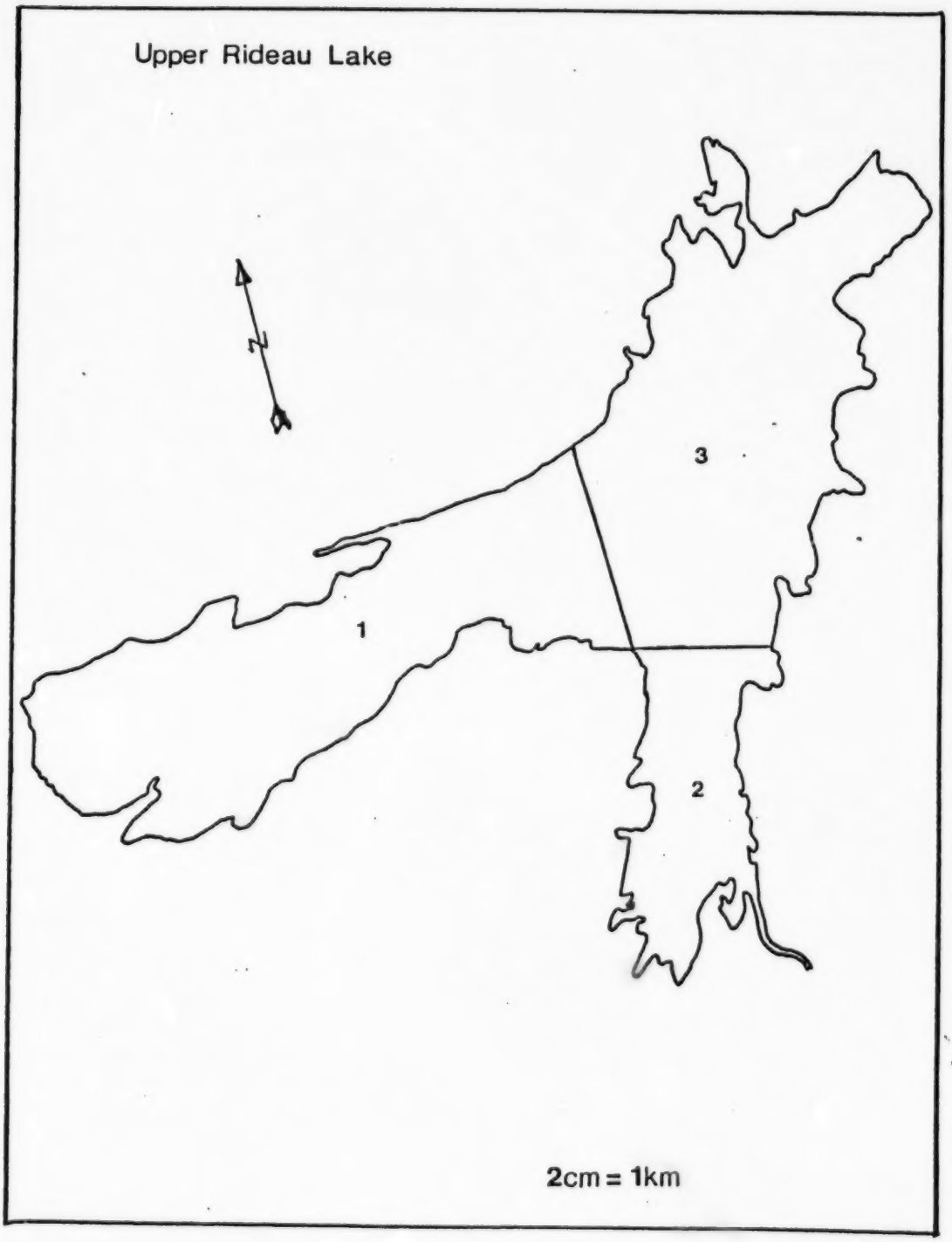
c) Upper Rideau Lake



a) Mica and Sydenham Lakes.



b) Sydenham Lake.



c) Upper Rideau Lake.

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